THIGNS NOT COMMONLY KNOWN

CONSISTING

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Domestic, Professional & Experimental purposes

COMPILED

BY

SOORJEE COOMAR SEN.

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THINGS NOT GENERALLY KNOWN.

ACID ANILIC—INDIGOTIC ACID.

This acid is formed by the long continued action of weak nitric acid on indigo. It is also formed in the preparation of Isatine if the preparation be pushed too far. It is indentical with nitrosali-cylic acid, obtained by the action of nitric acid on salicylic acid or on salicine. It forms fine yellowish—white prisms which are light and bulky, and shrink much in drying. It is fusible and volatile. By the action of strong nitric acid it is converted into oxalic and picric acids. It requires 1,000 parts of cold water for solution. Its salts crystallise well.

Acid Formic Preparation of.

Artificially it may be prepared by distilling together in a large retort, 1 part of dilute alcohol or of tartaric acid with ½ of peroxide of manganese and 1½ sulphuric acid diluted with three parts of sugar, starch, or any other vegetable substance that may be substituted for the tartaric acid.

Acid Carbozotic—acid Picric.

This is formed by the action of nitric acid on anilic acid, indigo, salicine, salicylic acid, carbolic acid, silk, aloes and other substances. It is most easily formed from carbolic acid, salicine, in the action of an excess of fuming nitric acid assisted by heat. It is purified by solution in hot water and recrystallization. It forms

pale yellow, or even white scales of silvery lustre. They dissolve in hot water with a strong yellow colour and very bitter taste. The acid is fusible and volatile. Its salts crystallize most readily, and all explode when heated. When these salts are put in contact with lime and green vitriol, blood-red solutions are formed containing the lime salt of a new acid. The picrate of potash is so sparingly soluble, especially in alcohol, that alcoholic solutions of picric acid may be used as a test for potash.

Acid Gallic.

This acid exists in the seeds of mango, and is formed by the decomposition of tannic acid. The best method is to boil tannic acid with sulphuric acid diluted with 8 parts of water, or to keep it near the boiling point for some hours replacing the water which evaporates. The liquid on evaporation yields a large crop of crystals, nearly pure on cooling. When coloured, gallic acid is purified from colouring matter by combining it with oxide of lead, and decomposing the gallate of lead, suspended in water by sulphuretted hydrogen. The sulphuret of lead acts as a decolorising agent.

It is sparingly soluble in cold water, requiring 100 parts, but dissolves in 3 parts of boiling water. Solutions of the acid and its salts strike a black color with persalts and pro-persalts of iron. When exposed to the air, the solution of gallic acid absorbs oxygen and becomes dark colored. This change is very rapid in the presence of alkalies, so that the alkaline gallates, especially if the alkali be in excess, are readily decomposed and become nearly black.

When dissolved in hot oil of vitriol, and precipitated from the cold solution by water, gallic acid is obtained in a peculiar form, called rufi-gallic acid.

This acid is a reddish—brown crystalline powder which might be used in dyeing, as it yields colours on cloth like those of madder. When heated it forms a sublimate of fine red prisms, which call to mind *Alizarin*, the crystalline matter found in madder.

Alizarin Crow, madder.

The root is the only part of the plant used for the purpose of dyeing; it is subjected to the operations of picking, drying, freeing from the earth and epidermis, and powdering. The powder is of a yellowish red colour, and contains three different colouring matters, two of which, alizarin and purpurin are red and one xanthin is yellow.—Alizarin, (from alizara, the Levant name for madder) is obtained by gradually mixing madder in fine powder with an equal quantity, in weight, of sulphuric acid and allowing the mixture to remain for some days; by this all the vegetable products but alizarin are carbonized; the residue is to be washed with water to separate the acid, then dried, and treated [illegible] with 2 oz of alcohol to separate a little fatty matter, and afterwards with repeated portions of boiling alcohol, which dissolves the alizarin; this alcoholic solution is to be treated with water, the alcohol to be separated by distillation, and the residual liquor being thrown on a filter, the alizarin remains on it. The alizarin may also be separated from the charred mass after it has been washed with water and alcohol, and dried by exposing it to a temperature of about 480 F. The alizarin then sublimes and concretes in long brilliant needles of a very fine red colour. Alizarin dissolves in alcohol and ether in all proportions; concentrated sulphuric acid dissolves it also and the solution is of a blood-red colour, from which, water throws down the alizarin. Amonia, potash and soda and their carbonates all dissolve alizarin and yield solutions of a most beautiful violet colour. Alizarin continues with different tissues which have been mordanted and forms with them very fixed colours which resist even the action of soap and boiling water.

Albumen.

The purest albumen is obtained from white of eggs, or the serum of blood, by neutralising carefully the alkali they contain, with acetic acid, and then adding cold water, which causes the deposition of translucent flocculi, which, when washed with water, have the appearance of flour paste. This, dried at a gentle heat, is albumen, as pure as we know it.

If white of egg, mixed with twice its bulk of water be pressed through a cloth, to break the cells and a little sub-acetate of lead added to the liquid, an abundant precipitate is formed. This is to be washed, mixed with water, and decomposed by a current of carbonic acid. The whole is filtered and to the filtered liquid there are added a few drops of sulphuretted hydrogen, and it is warmed to boil 140 F. not more, when the first flocks of albumen which coagulate, carry down with them the whole of the sulphuret of lead. The liquid is now again filtered, and evaporated to dryness at 104 F. when the residue is soluble albumen, and is said to be free from mineral matters.

Albumen pure coagulated.

To obtain pure coagulated albumen mix white of egg with its bulk of water, filter and evaporate at 104 F, to the original bulk. Then add a concentrated solution of caustic potash. The whole soon forms a translucid yellowish elastic mass. This is broken up, exhausted by cold water avoiding the contact of air. It is then dissolved in boiling water, or in boiling alchohol, and the solution precipitated by acetic or phoshoric acid. The precipitate, if well washed, is pure insoluble albumen, and leaves no ash when burnt.

Soluble albumen thus purified is transparent, amorphous, almost colorless and tasteless. It leaves, at most, a very trifling ash, which is neutral. It dissolves slowly in water at a moderate heat, but not entirely, some part becoming insoluble. Its concentrated solution is ropy, like the white of egg. White of egg dried *in vacuo* leaves thirteen percent of ash, chiefly phosphate of lime.

Alcohol to free from any admixture of water.

The most convenient method for the purpose is, by adding some dry potash or potash heated to 30°: the salt imbibes and dissolves in the watery part of the spirit and forms at the bottom

of the vessel, a distinct fluid from which the pure spirit on the top may easily be decanted. The salt must be added so long as it keeps dissolving and then stopped

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Alcohol instantaneous conversion of into vinegar.

Under a large glass case several saucers are to be placed in rows upon shelves, over each other, a few inches apart. A portion of black platina powder slightly moistened should be suspended over each dish, then put into each saucer a small quantity of vinous spirit, 100 cubic inches of air can oxygenate 110 grains of absolute alcohol converting them into 122 grains of absolute vinegar and 64½ grains of water. The above simple apparatus is to be set in sun shine and the evaporation of the alcohol is to be promoted by hanging several leaves of any porous paper in the case, so that their bottom edges be dipped in the spirit. In the course of a few minutes a most interesting phenomenon will be produced. The mutual action of the platina and alcohol will be displayed by an increase of temparature and a generation of acid vapors, which condensing on the sides of the glass bell or case trickle in streams to the bottom. This sticking transformation continues till all the oxygen of the air be consumed. If we wish then the process to continue, we must by raising the glass case, let in more air with a box of 12 cubic feet in capacity and with a provision of 7 or 8 ounces of the platina powder, we can in the course of a day, convert 1lb of alcohol into pure acetic acid or vinegar and fit for every purpose both chemical and culinary. With 30 pounds of the platina powder (which does not waste) we may transform daily nearly 300 lb of lead spirits into the finest vinegar.

Alloy for varnishing figures.

Fuse ½ oz of tin, with the same quantity of bismuth in a crucible; when melted add ½ an ounce of mercury. when perfectly combined, take the mixture from the fire and cool it. This sub-

stance mixed with the albumen of an egg, forms a very beautiful varnish for plaster figures.

Beautiful alloy of Antimony and Copper.

Put into a crucible 1 oz of copper and an equal quantity of antimony. Fuse them by a strong heat, and pour the alloy into a mould. The compound will be very hard and of a beautiful violet hue.

Alloy for soldering.

Put into a crucible 2 ounces of lead and when melted throw in an ounce of tin. When heated by a hot iron and applied to tinned iron with resin in powder it acts as a cement. It joins leaden pipes.

Alum crystals—method of colouring.

In making these crystals the colouring should be added in the saturated solution of alum in boiling water in proportion to the shade, which it is desired to produce. Cake, with a piece of lead attached to it in order to make it sink in the solution, is the best substance for a nucleus; or if a smooth surface be used, it will be necessary to wind around it cotton or worsted threads, otherwise no crystals will adhere to it.

Alum—use of as a mordant.

Alum to make a mordant is dissolved in water and very frequently a quantity of tartarate of potash is dissolved with it. Into this solution woollen cloth is put and kept in it till it has absorbed as much alumine as is necessary. It is then taken out, washed and dried.

Alumina to obtain.

The common salt called alum, a compound of sulphuric acid, alumina and potash, is used for the preparation of alumina. Alum is dissolved in 4 times its weight of boiling water, carbonate of potash is added and the resulting precipitate well washed with hot water. As the alumina thus prepared shall contain some sulphate of potash, it is re-dissolved in muriatic acid and precipitated by amonia. This precipitate when well washed and heated to readness is pure alumina.

Alumina pure to obtain.

Alumine may be obtained pure by adding in the first place, to a solution of alum in 20 parts of water, a small quantity of a solution of carbonate of soda, and afterwards a little water of amonia (aqua-amonia) to the supernatant liquid. The precipitate well washed, dried and heated to a considerable degree is pure alumine.

Amalgam for gilding

The amalgam of gold is made by heating in a crucible some pure quicksilver; and when it is nearly in the boiling state, about the sixth part of its weight of fine gold in thin plates, is to be immersed in it. The mixture soon becomes homogeneous, then it is cooled. When cold it is to be put in a piece of soft leather or chamois skin, and by gradual pressure the fluid part of the amalgam consisting almost wholly of mercury, may be forced through the pores of the leather: while the gold in combination with about twice its weight of mercury, will remain behind forming a mass of the consistence of butter. This, after being carefully ground in a mortar, or shaken in a strong phial, with repeated portions of salt and water, till the water comes away quite clear and unsoiled, is fit for use, and may be kept for any length of time in a corked phial. It is of utmost importance that the materials of the amalgam and especially the mercury should be perfectly pure otherwise the gilding will appear dark and tarnished.

Amalgam for the cushions of Electrical machines.

Melt together in a crucible 2 drs. of zinc and one of tin. When fused, pour them into a cold crucible, containing 5 drs. of mercury. The mercury will combine with these metals and form the alloy required. Before this is applied, it is proper to rub the cushion with a mixture of tallow and bees' wax.

Aniline Hofman's process.

Hofman has lately shewn that isatine when heated with potash yields aniline.

Antimony—curious compounds of with other metals.

An alloy of one part of antimony with 100 parts of gold, renders the latter as brittle as glass.

If 70 parts of antimony are fused with 35 parts of iron, an alloy is produced which has the singular property of giving off an abundance of sparks when it is filed.

When metallic antimony in powder is mixed with an equal quantity of incerated cream of tartar and heated strongly, a substance is formed, which resembles antimony in appearance; but takes fire when touched by moistened paper.

If 75 parts of incerated cream of tartar, 100 parts of antimony and 12 of lamp black be heated to redness in a close crucible and allowed to cool the resulting alloy spontaneously inflames on opening the crucible and with such violence, that the mixture is projected in a ball of fire like a rocket.

Asphultum, mineral pitch, Pitch of India

These are the names of certain substances of similar characters, found in different parts of the world, as in Trinidad, in Hanover, and at the dead sea in Palestine. They all resemble pitch in aspect

and are composed of a dark brown resin, mixed with more or less of brilliant black matter asphaline or of a liquid volatile oil, petrolene. The former of these is probably an oxide of the latter. The different kinds of asphaltum are much used for waterproof cements, and for pavements or roofs. Naphtheine is a somewhat analogous substance, found in the limestones of the *Maine and Loire.*

Aurum Musivum—Woulfe's process for preparing.

Twelve parts of tin are melted in a crucible and 3 parts of mercury are added to it. The amalgamation of the metals is completed by rubbing the mass to a fine powder. It is then intimately mixed by trituration with 7 parts of sulphur, and 3 parts of muriate of amonia. The mixture must then be put within matrass of which it fills one half, and exposed to heat as long as any white vapors are disengaged.

On increasing the heat a little, sulphuret of mercury with a proportion of muriate of tin, sublimes, and the aurum musivum remains at the bottom of the matrass.

If the process has been properly conducted it is of a flaky texture and rich yellow colour; if too much heat is applied only common sulphuret of tin is formed.

Bareilly painting.

A quantity of pure tin is melted and poured into a joint of bamboo closed at both ends, except the hole at which the tin is poured, which is instantly plugged up. The bamboo is then violently shaken, which makes the metal assume the form of a very fine grey powder; this being sifted, to separate the coarse particles, is mixed up in thin melted glue, and then is levigated in a stone with a muller. The result is poured into dishes (commonly cocoanut shells) to settle, and the superfluous moisture poured off. When to be applied, it should be laid on with a soft brush like ordinary paint. When dry, it appears like a coat of common grey water colour. This is gone

over with an agate burnisher, and then forms a surface of polished tin. To give this the appearance of gold, apply a coating of any lacquer or yellow Varnish.

Beehive to approach without the risk of being stung by the bees.

Stain your face and hands, and likewise such parts of your body as may be exposed, with the juice of common basil of this country, the smell of which will effectually hinder the bees from approaching your person. It is proper at the same time to have a small branch of the same plant in your hands.

Bell Metal.

Six parts of Copper and two of tin melted together. Bells are made with this.

Biddery.

Biddery is composed of Copper 16 oz. lead 4. oz tin 2 oz. These are melted together and to every 3 oz of the alloy 16 oz of spelter are added, when the metal is melted for use. To give to the ware its esteemed black colour, it is dipped in a solution of salamonia, saltpetre, common salt and blue vitriol.

Blacking for Harness.

Melt 2 oz. of mutton suet with 6 oz. of bee's wax, add 6 oz. of sugarcandy and 2 oz. of soft soap dissolved in water and 1 oz. of indigo very finely powdered; and when melted and well mixed, add a gill of turpentine. Lay it on the Harness with a sponge and polish with a brush.

Blacking to Make.

Take of ivory black and treacle, each 6 oz. Vitriolic acid, and spermacite, or common oil, each 1½ oz, mix the acid and oil first, afterwards add the other ingredients: if, when it is used, it does not dry very quick, add a little more of the Vitriol, a little at a time, till it dries quick enough when there is too much of the Vitriolic acid, which is various in its strength. The mixture will give it a brown colour.

Blacking Cakes.

Take Gum Tragacanth 1 oz, neats foot oil, superfine ivory black, deep blue prepared from iron and copper each 2 oz. brown sugar-candy, river water each 4 oz; having mixed well these ingredients, evaporate the water and form the cakes.

Blacking Balls for Shoes.

Take mutton suet 4 oz; bee's wax 1 oz. sweet oil 1 oz. sugarcandy and gum arabic each 1 dr. in fine powder; melt these well together over a gentle heat and add thereto a spoonful of turpentine, and lamp black sufficient to give it a good black colour. While hot enough to run, make it into a ball by pouring liquid into a tin mould; or let it stand till almost cold; or it may be moulded by the hand.

Blacking for Shoes.

A shining blacking may be made by the following method. A pint of small beer or vinegar to an ounce of lamp black or ivory-black with the addition of half an ounce of brown sugar and as much gum arabic. The white of an egg substituted for the gum makes the blacking more shining.

Blacking liquid Japan to make.

Take 3 oz. of ivory black, 2 oz. coarse sugar, 1 oz. of sulphuric acid, 1 oz. of muriatic acid, 1 table spoonful of sweet oil and lemon acid, and one pint of vinegar. First mix the ivory black and sweet oil together then the lemon and sugar with a little vinegar to qualify the blacking; then add the sulphuric acid and muriatic acid and mix them all well together.

Another method.

¼lb ivory black, ¼lb of moist sugar, a table spoonful of flour, a piece of tallow about the size of a walnut and a small piece of Gum Arabic: Make a paste of flour and whilst hot, put in the tallow, and afterwards mix the whole together in a quart of water.

Blacking Japan liquid a cheap method.

Ivory black 2 oz., brown sugar 1½ oz. and sweet oil half a table spoonful. Mix them well and then gradually add ½ a pint of small beer.

Blue Prussian.

Is prepared by drying blood, mixing 3 parts of the dried residium with 2 parts of the potash of commerce and calcining the mixture in a crucible by a red heat, it is then boiled in successive portions of water, which are afterwards mixed together and concentrated by evaporation. A solution is prepared of one part of sulphate of iron and two parts of alum and to this the liquor obtained from the calcined blood alkali is added, as long as any precipitate is formed. This precipitate is of a green colour but by washing it with

a little dilute muriatic acid, it becomes of a dark rich colour. This is the Prussian blue of commerce.

Blue to produce, by mixing two colourless fluids.

Pour a little of the solution of sulphate of Iron into a glass, then add to it a few drops of a solution of Prussiate of potash, and the whole will assume a beautiful blue colour.

Blue colour beautiful.

Six parts of sulphate of copper were dissolved in a small quantity of water; also six parts of white arsenic with eight parts of potash of commerce were boiled together until no further quantity of carbonic acid was disengaged. This hot solution was gradually mixed with the first continually agitating until effervescence ceased. An abundant dull yellowish green precipitate was formed. About 3 parts of acetic acid was then added, gradually the precipitate diminished in volume, and in some hours, a slightly crystalline powder was deposited at the bottom of an entirely colourless solution. The fluid was poured off as soon as possible and the powder washed with the plenty of boiling water to remove the remaining portions of arsenic, was then of a brilliant colour.

Blue to tinge steel or Iron.

The articles of steel or Iron must be finely polished and rendered perfectly pure of oils or any other fatty substance, and then exposed to a uniform degree of heat. The *gools* of this country well burnt and reduced to powder and evenly spread, answers remarkably well for this purpose. The work must be covered over with the *gool* powder and carefully watched. When the colour is sufficiently heightened, the work is perfected. The blue colour is removed with a very dilute muriatic acid.

Brass.

Put 4½ oz. of copper into a crucible, expose it to heat in a furnace and when perfectly fused add an ounce and a half of zinc. The metals will combine and form brass.

Brimstone in imitation of marble, to prepare.

Provide a flat and smooth piece of marble having raised edge all round, which may be made either of wax or clay. Then having several sorts of colours, as white lead, red lead, verdigris, &c. melt on a slow fire some brimstone in several glazed pipkins: put one particular sort of colour in each and stir well together; then having before oiled the marble quickly drop spots upon it of all sizes; after this take another colour and do as before, and so on till the stone is covered with spots of all the colours designed to be used. When this is done, consider next of what colour you would wish the ground to be: if of a grey colour, then take some fine sifted ashes and mix them up with melted brimstone or if red, with English red ochre, if white, with white lead; or black, with lamp black. Then in its melted state pour it over your marble, and the coloured dots will be firmly imbedded in the mass and have a beautiful appearance when turned.

Browning gun Barrels.

One ounce of Oximuriate of Mercury dissolved in water is used for the above purpose.

Bronze.

Melt in a crucible 7 oz. of pure copper; when fused, throw into it 3 ozs. of zinc and 2 ozs. of tin. These will unite and form Bronze.

Bronzing metals.

A solution of salamoniac and salt of sorrel in vinegar is enough for the purpose. Any number of coating may be applied and the shade becomes deeper the oftener it is repeated.

Bronzing Casts in Plaster of Paris figures, &c.

Grind in a weak solution of size, a little Prussian blue, lamp black, and yellow ochre and apply this colour with a hair pencil all over the surface intended to be bronzed, and before it is completely dry, we dip the end of another moistened brush in the powder of mosaic gold and apply a little of it to all the projecting parts.

Bronzing Brass Works.

Receipts for making Green Bronze.

Take 1 quart strong vinegar, 1½ oz. mineral green, 1½ oz. of raw umber; 1½ oz. of salamoniac, 1½, of gum arabic, 1½ oz. of copperas, 2 oz. of French berries. Dissolve the different salts homogeneous in small portions of vinegar, then mix the whole in a strong earthen vessel and make the mixture boil. Then allow it to cool and filter it through a flannel bag, when the bronze will be fit for use.

Bronze commonly used by Brass founders Receipt for making.

Take 1 part of strong vinegar, 1 oz. of salamoniac, 1½ oz. of alum, 1½ oz. arsenic, dissolve them in the vinegar and the compound is fit for use.

Cleaning work—previous to using Bronze—is either by filing, rubbing with sand paper or dipping in aquafortis. The latter is the best as it perfectly frees the metal from oil and grease stains.

This must be done with a small brush and great care must be taken to keep the work constantly wet with the liquid to prevent its turning green when the colour which is wished has

been attained, which will generally be quickly washed in clean cold water and then dried in soft warm saw dust, after which the whole is laid over with a coating of lacquer which preserves the colour.

Bronze copper coloured for Plaster of paris figures.

Dissolve copper in aquafortis, until it is saturated and then putting into the solution some small pieces of iron, when the copper will be precipitated in the metallic state, the fluid must then be poured off and the powder carefully washed, dried and levigated, when it may be put by for use.

Bubbles of fire from water to procure.

Drop a lump of Phosphuret of lime into a glass of water, and bubbles of Phosphuretted hydrogen will arise which take fire the moment they come in contact with the atmosphere.

Calico printings and Dyes.

When good kermes (cochineal) is plump of a deep red colour, having an agreeable smell, and a rough and pungent taste its tinctorial matter is soluble in water and alcohol; it becomes yellowish or brownish with acids, and violet or crimson with alkalies. Sulphate of iron blackens it. With alum it dyes a blood red; with sulphate of iron, an agate grey; with sulphate of copper and tartar an olive-green; with tartar and a salt of tin, common yellow. Scarlet and crimson dyed with kermes were called grain colours, which are accounted more durable than those of cochineal. The latter, however, and lacdye, have now superceded the application of kermes as a tinctorial substance in England. For a red, with tin about twelve times the quantity of Kermes, as of cochineal is required and the colour is rather inferior. As a dye it is not much used, and only for silk or woollen. There seems to be no affinity between cotton and the tinctorial matters of cochineal, lac, and kermes.

Alkanet.—(qualities of).—Dark red, insoluble in water, soluble in alcohol and very much so in ether, fat and volatile oils, to all of which it imparts a brilliant red hue. Alcoholic or etherial solution if boiled with water becomes brown. The red colour primarily changes to a bluish green and a black substance remains on evaporation to dryness, soluble in water and alcohol. The latter solution, is reddened by chlorine, rendered grey by acids and blue by alkalies; protochloride of tin occasions a crimson; sub-acetate of lead a blue precipitate; salts of iron give a dark violet, and chloride of mercury a flesh coloured precipitate. To obtain the alkanet colour all the soluble matters are first abstracted from the bruised root by water; it is then digested in a solution of carbonate of potassa, from which it may be readily precipitated by an acid. It may likewise be procured by carefully digesting the alcoholic extract of the root in ether and evaporating the solution on a water bath.

Carmine.

This name has been given to the colouring matter of cochineal, which is nitrogenised, and may be obtained in dark red crystalline grains, very soluble in water and alcohol. It forms with alumina a beautiful red lake, well known as carmine.

The colouring matter of cochineal has been studied with great care by Warren de-la Rue. It is extracted by boiling water, precipitated by acidulated acetate of lead, the precipitate well washed, decomposed by sulphuretted hydrogen and the red solution thus obtained again treated with lead and sulphuretted hydrogen. It is now dried up at a heat not exceeding 94F, and $\frac{7}{8}$ of the dry mass dissolved in boiling absolute alcohol. The remaining $\frac{1}{8}$ is dissolved in boiling water precipitated by acetate of lead and the precipitate added to the alcoholic solution. By this means the last traces of phosphoric acid are separated as phosphate of *lead*, ether is now added to the alcoholic solution, which throws down some azotised matter, with a little of the colouring substance. This precipitate is re-dissolved in alcohol and

precipitated a second time by ether, when the colouring matter first carried down remains dissolved. This solution is added to the other, the whole distilled and the residue dried in vacuo. This is the pure colouring matter, or *carminic acid.* It is a friable mass of a dark purple brown giving a fine red powder, soluble in water and alcohol; but hardly in pure ether. It dissolves also in acid. Its solution is precipitated by alkalies, and also by alum if a little ammonia be added yielding fine lakes.

Carmine German.

Boil 2 oz. of cochineal in powder in 6 pints of river water. After having boiled for 6 minutes they add 60 grains of powdered alum and then boil them again for 3 minutes. The basin is then removed from the fire and the liquid drawn off with a syphon; this is then passed through a silken sieve and placed in several earthen vessels; here it is left at rest for 3 days; it is then again decanted and the liquid placed in other vessels and where it must again remain for 3 days. The deposits which are formed, must then be placed to dry in the shade. The first contain carmine of the first quality; but the others are inferior.

Carmine Common.

1 lb of powdered cochineal, 3½ drs. of subcarbonate of potash, 8 drs. of alum in powder and 3½ drs. of isingglass.

The Cochineal is first boiled with the potash in a copper vessel containing 5 pails of water: the effervescence is stopped with cold water. After having boiled for some minutes, the boiler is removed from the fire and placed on a table inclined that the liquor may be easily poured off. The powdered alum is then thrown and the decoction stirred when it immediately changes its colour and turns to a more brilliant tint. In about quarter of an hour, the cochineal is deposited at the

bottom, and the liquid is as clear as it had been filtered. The liquor is then decanted into another boiler of the same size and set on the fire; adding to it isingglass dissolved in water and passed through a sieve. At the moment of the ebullition the carmine is seen rising to the surface of the bath and a coagulation is formed similar to that which takes place in the clarifications made with the white of eggs. The boiler must be withdrawn from the fire and the bath be stirred up with a spatula. In 15 or 20 minutes, the carmine is deposited; the liquor is then decanted and the precipitate laid to drain upon a very fine sieve

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Carmine Madame Cenette's.

Six pailsful of river water are put into a boiler and set on the fire. At the instant when boiling commences, 2 lbs. of cochineal finely powdered, are added. After 2 hours' boiling, 3 ozs of pure nitre are put to it and presently afterwards four ounces of salt of sorrel. After allowing it to boil 10 minutes longer the boiler is removed from the fire and left to rest at least 4 hours. The carmine water is then distributed into several vessels and allowed to remain undisturbed for 3 or 4 weeks. In a short time a thin skin of moulding forms upon the top, which is removed with a small sponge, tied to the end of a stick. The water is then drawn off with a syphon, and the carmine dried in the shade is almost too brilliant for the eye to endure.

Carmine Chinese.

20 oz of very finely powdered cochineal are boiled with a pailful of river water, to which 60 grains of Romam alum are added. After 7 minutes' boiling, it is removed from the fire, and the liquor put into another vessel by means of a syphon. This must be preserved for use. A solution of tin is previously prepared in

the following manner: 10½ oz. of common salt are dissolved in a pint of aquafortis; to this solution when cold 4 oz. of Malacca tin filings are added by degrees; a fresh quantity of tin must not be put in till the former is dissolved. The solution is added drop by drop to the heated cochineal liquid and the carmine is precipitated which must be dried in the shade, in China or other vessel.

Carmine Crayons.

Lay a sufficient quantity of crayons upon a grindstone and soften it with spirit of wine making use of a levigating knife till it becomes smooth and even, then mix this with the prepared whiting and form your crayons. The process is the same with all colours. Perhaps the addition of a little thin size may be used in all these processes with advantage.

Caoutchouc (Solvents for)

It is soluble in ether, naphtha, coal-tar naphtha, bisulphuret of carbon, and essential oils. Its solution in ether and coal-tar naphtha, when dried up leave the caoutchouc in an inelastic state.

Caoutchouc solvents—another method.

Gerard, in 1850, secured by patent, the right of using alcohol mixed with spirit of turpentine, sulphide of carbon, chloroform, benzole, ether, electra, in dissolving caoutchouc. According to the patentee when the alcohol is mixed with either of the above liquids in various proportions, from five to fifty percent and the menstrum afterwards used to dissolve the India Rubber, a much more concentrated varnish is obtained *than* with the spirit *perse*. The method described is to mix the alcohol with the Solvent as above, and use

the same weight of it as caoutchouc ; but according to the degree of concentration which the varnish should possess, the quantity of solvent is increased to as much as three parts to one of caoutchouc after 48 hours' contact, the mass is submitted to the usual kneading provided only small quantities of the solution are employed ; but when a large proportion of the liquid is required then it is merely dissolved by the power of the liquid, the heat that is usually developed during the process becomes useless. The effect of the alcohol in contributing to the formation of varnish is that it integrates the mass of material, and separates the component particles. It has been shewn already that alcohol does not dissolve this substance and in fact precipitates it from its solution, a property which the patentee has sought to turn to advantage in the preparation of the varnish. This varnish is applied to the stuff with a wooden spatula.

Disagreeable smell to remove with verbena root, lavender, camomile, florentine iris, whorl flowers, &c.

Volcanised caoutchouc. Proportion 10 sulphur and 60 rubber.

Caoutchouc rigid-Goodyear's process.

Rigid caoutchouc with magnesia. Buttons, slates, &c. can be made of that compound, combs, braces, boots, shoes, noiseless carriage-wheels, &c.

Catechu method of preparing.

The heart or the central part of the tree named *munosa catechu* is cut into bits, and put with half the quntity of water in an earthen pot, and boiled for about 3 hours or until the decoction becomes ropy, which is then poured out into another vessel. The same quantity of water is again added and boiled until it becomes ropy a second time, when it is again poured out into the pot containing the first decoction,

and the process is repeated a third time. The 3rd decoction is well mixed and boiled on the day following in small pots until the extract becomes as thick as tar; it is then allowed to remain in the pots for two days, when balls are made for exportation.

Caustic soda to change into common salt.

Pour a little muriatic acid upon some caustic soda, and it will be converted to table salt.

Cement for Damp floor.

Boil two quarts of tar with two ounces of grease for a quarter of an hour, in an iron pan. Add some of this tar to a mixture of slaked lime and powdered glass, which has been passed through a sieve and been dried completely over the fire in an iron pan, in the proportion of two parts of lime and one of glass, till the mixture becomes of the consistence of a thin plaster. This cement must be applied as soon as it is made, as it hardens very rapidly. The above may be used in uniting broken marbles and similar things.

Cement that resists the action both of fire and water.

Take ½ pint milk, mix it with an equal quantity of vinegar; separate then the curd from the whey, and mix the latter with the whites of 4 or 5 eggs previously well beaten up. The mixture of these two substances being completed add to them quick lime which has been passed through a sieve; make the whole into a thick paste of the consistence of putty for use. Fissures in iron cauldrons and vessels of copper and brass may with safety be closed with this cement.

Cement Diamond, for broken glass.

Take good, clear isingglass 1 oz. distilled water 6 oz. boil together down to 3 oz. add 1½ oz. strong spirit of wine, boil this mixture for a minute or two, then strain it; add while hot, first ½ oz. of a milky emulsion of gum ammoniac and then 5 drs. of an alcoholic solution of resin mastic.

Cement for Iron.

16 Parts of iron turnings, 4 parts of sulphur in coarse powder and 1 of Salammonia to be steeped for one night in water, and used.

Cement for fixing handles to knives, &c.

Take 7 parts of Comon resin and 1 of wax, melt these, and add some fine brick dust.

Cement for fixing precious stones when grinding or cutting them.

Melt in a ladle equal parts of shell lac, and pumice stone, reduced to a very fine powder, stirring them well till they become perfectly incorporated.

When required for use, it is softened by the application of heat.

Cement for filling cracks in iron vessels or for joining iron tubes together.

To this purpose 2 oz. of flowers of sulphur, 1 oz. of salammoniac, in powder and 16 of iron filings are mixed, and passed through a

sieve. To this 20 lbs of iron filings are afterwards added, and when to be used, the mixture is made into a paste with water, and applied to the juncture.

Cement for Entomoligists.

To a solution of a Gum ammoniac in proof spirit add the best isingglass and unite them with a gentle heat. This cement is made use of by naturalists to rejoin the broken articulations of insects, for which it is very convenient.

Cement that will not be effaced either by damp or moisture.

Equal parts of Gluten and lime well mixed with the addition of a few drops of water, produce a cement that dries easily and remains uninjured even during the rainy seasons.

Cement for broken China.

Beat lime into the most impalpable powder, sift it through fine muslin. Then put on the edges of the broken China, some white of eggs, then dust some lime quickly on the same and unite them carefully.

Cement or mortar beautiful for outside plastering.

Take 84 lbs of drift sand and 12 lbs of unslake lime and 4 lbs of curd, when these are well mixed, add enough hot water to make into a proper consistence for plastering, such a quantity of the above as

is wanted. It requires very good and quick working. This cement resists all weather and may be used to line aqueducts, reservoirs, as no water can penetrate it.

Charcoal to inflame by pouring upon it a liquid.

If highly concentrated nitric acid be poured upon pulverised fresh charcoal a vivid inflammation will be produced. If the same acid be poured upon warm spirits of turpentine, it will cause it to burst into a flame.

Chemical affinities.

To precipitate copper, dip a clean piece of iron in a solution of blue vitriol, and it will immediately be encrusted with a thick copious coating. In the mean time the iron that has been dissolved may be precipitated by a small bit of zinc, and zinc by the introduction of lime or chalk, and the lime, by pouring into the solution spirits of harts horn.

Chemic blue and green.

Take 1 lb of the best oil of vitriol which pour upon 1 oz. of Indigo well powdered and sifted, add to this after it has been well stirred a small lump of pearl ash as big as a pea or two peas: as soon as the fermentation ceases put it into a bottle tightly corked and it may be used the next day; if more than the prescribed quantity of pearl-ash be added, it will deaden the tint. Chemic Green is made as above only adding $\frac{1}{4}$ more of the vitriolic acid.

Chimney pieces stone artificial.

Take two bushels of clear drift sand and one bushel of sifted quick lime; mix them together with as little water as possible and heat

them well up together for half an hour every morning, for three or four successive days but never wet them again after their first mixture. To 2 Gallons of water, contained in a proper vessel, add one part of weak size made warm; ¼ lb of alum is then dissolved in warm water and mixed with the above liquor. Take about a shovelful of the first composition, make a hole in the middle of it, and put therein three quarters of a pint of the above mixture of alum and size, to which add 3 or 4 lbs of coarse plaster of Paris, the whole is then to be well beaten and mixed together rather stiff, and may be moulded into a variety of ornamental figures, representing men, animals, &c., moulds of wood are generally used for the above composition. Before putting your composition within the mould, it must receive an internal coating of the following, take one part of sweet oil and add thereto one part of clear lime water on lumps of chalk-lime in a close vessel, till fully saturated; when the lime water becomes clear, it is fit to be added to the oil as above mentioned, and on being stirred together, they will form a thick soapy mixture proper to apply to the moulds.

China Paste to make.

Mix together bullocks' blood and quick lime in the proportion of 1 lb of the latter to 10 lbs of the former. It becomes a stiff jelly, when with the addition of a little water it is fit for use.

Chlorine gas, formation of and various experiments with it.

Put into a glass retort a quantity of Hydro Chlorine (Vulga muriatic acid) with half its weight of powdered peroxide of manganese; apply the heat of a spirit lamp or any gentle heat, when the gas will escape in bubbles of a greenish colour. This should be collected over salt water in bottles likewise filled with it, and having close fitting stoppers, which should be rubbed with a little oil.

If antimony, copper, zinc and bismuth either in powder or in fine leaves be introduced into the bottle containing chlorine gas, they will instantly inflame. If flowers and leaves are introduced they are instantly bleached white.

Chlorine of mercury, solution of for preserving insects.

Take a small tumbler and fill it with alcohol and throw in it chloride of mercury, about the size of a hazel nut; when it is dissolved, the solution is fit for use.

Chloride of lime for destroying insects.

In scattering chloride of lime on a plank in a stable all kinds of flies but more specially biting flies are quickly got rid of. Sprinkling beds of vegetables with even a weak solution of this salt effectually preserves them from the attacks of catterpillars, butterflies, &c., It has the same effect when sprinkled on the foliage of fruit trees.

A paste of one part of powdered chloride of lime, and one half part of some fatty matter, placed in a narrow band round the trunk of the tree prevents insects from creeping up it. It has been noticed that rats and mice quit places in which a certain quantity of chloride of lime has been spread. This salt dried and finely powdered can be employed for the same purpose as flower of sulphur and be spread by the same manner.

Chlorisatinate of silver.

Forms yellow crystals, soluble in hot water; chlorisatinate of baryta forms Golden yellow tables; chlorisatinate of lead, when first precipitated from the salt of potash by nitrate of lead, forms a gelatinous yellow precipitate, which soon becomes flocculent, acquiring a splen-

did scarlet colour. The red salt is crystalline, the yellow—amorphous. Chlorisatinate of copper forms at first a brownish—yellow, bulky precipitate, which soon changes to a heavy granular blood-red powder.

Chlorisatinate—Bi.

Bichlolorisatine is formed along with the preceding compound. It is more soluble than chlorisatine, but is otherwise remarkably similar to it. With aqua potassæ it forms a deep-red solution (here, as in the case of isatine and chlorisatine, a compound of it with potash), which, when heated, changes to yellow, and on evaporation yields yellow scales of a salt composed of potash and bichlorisatinic acid.

The acid may be separated by stronger acids as a yellow powder which when dissolved and warmed is resolved into bichlorisatine and water. The salt of baryta forms golden yellow needles. The salt of copper is at present bulky and brown, but soon becomes greenish yellow and crystalline and finally, a heavy granular powder of a fine carmine—redcolour.

Cinchona Bark Bases of.

Quinine. This important alkaloid is found along with cinchonine, in most species of cinchona bark. It predominates in yellow bark, *cinchona flava, china regia* or *c. calisaya*; and is obtained by boiling with excess of milk of lime the decoctions, in diluted hydrochloric acid, of the the bark, and treating the precipitate with hot alcohol, which dissolves cinchonine and Quinine. On evaporation, the cinchonine is deposited in crystals and the Quinine remains dissolved. Water is added, which causes the quinine to separate as a resinous mass. It may be obtained in crystals as a hydrate with 6 aq. there is another crystalline hydrate with 2 aq. by the spontaneous evaporation of its solution in absolute alcohol and in acids. Its solutions are very bitter when heated by hydrate of potash, it yields carbonate of potash, hydrogen gas, and quinoline or leacoline.

Quinine is decidedly alkaline and neutralizes the acids. Its salts especially as febrifuge and tonic remedies, are in most cases very superior to the bark in substance. The acid sulphate is more soluble in water; hence in draughts, sulphate of quinine is generally dissolved in diluted sulphuric acid.

Cinders, or little wicker to make.

Saturate water kept boiling with alum: then set the solution in a cool place, suspending in it by a hair a fine silk thread, a cinder, a sprig of a plant or a small basket; as the solution will cool, the article shall be thickly encrusted with beautiful crystals.

Cinnabar in the humid way preparation of.

Triturate in a porcelain cup with a glass pestle 300 parts of mercury with 68 of sulphur moistened with some drops of a solution of potash, till a black pro-to-sulphuret is formed and then add 160 parts of potash dissolved in an equal quantity of water. Heat over the flame of a candle the cup containing the mixture continuing the trituration without intermission; add pure water from time to time as the liquid evaporates that the oxide may be constantly covered an inch deep after two hours continued trituation, a great part of the liquid being allowed to evaporate the mixture begins to change from black to brown and then quickly to red. No more water is to be added but the trituration should be continued. The mass will acquire the consistence of a jelly and the red becomes still more brilliant with great rapidity: when it has attained its highest perfection, the cup should instantly be removed from the flame or the red will be quickly converted to a dirty brown colour.

Coal Tar Perfume.

Coal-tar has a most disagreeable and yet the chemist obtains from one of its products a most agreeable perfume. This is nitro-

benzole a compound of nitric acid (aquafortis) and benzole. Coal-tar when distilled, yields naphtha which is a liquid possessing great solvent powers in dissolving guttapercha—Indian Rubber and many other resinous gums. Naphtha when distilled at a low temperature yields benzole which is a very volatile liquid. It has been used for making gas illumination upon a small scale without distillation; but it is chiefly employed for cleaning soiled gloves, silks, &c. It dissolves grease and oils hence its utility in cleaning light—coloured soiled articles.

Benzole combines with nitric acid in definite proportions and forms a heavy oil-looking liquid called nitro-benzole. Its odour is like that of almonds and it is extensively used in perfumery as a substitute for it. We have also seen it stated that it is used in confectionary as substitute for the oil of almonds. This is a dangerous application of it, because it is a poison and is deeply injurious to the human system when taken in very small quantities. As a perfume it may be employed without much danger but its use for this purpose should be avoided. It may be safely assumed that it is not required except to disguise unpleasant odours.

Cobalt Blue.

Is prepared by digesting the cobalt with nitric acid, evaporating the nitrate almost to dryness, diluting it with water, and filtering, to separate the arseniate of iron which usually is precipitated. The clear liquor is to be poured into a solution of phosphate of soda, whence an insoluble phosphate of cobalt falls. This being well washed is to be intimately mixed in its soft state with 8 times its weight of well washed gelatinous alumina which has been obtained by pouring a solution of alum into water of ammonia in excess. The uniformly coloured paste is to be spread upon plates, dried in a stone, then bruized dry in a mortar enclosed in a crucible and subjected to a cherry-red heat for $\frac{1}{2}$ hour; on taking out the crucible and letting it cool, the pure blue pigment is to be put into a stoppered bottle till used.

Colour (coal and colour).

It is difficult to associate coal with colours, yet it is from such an unsightly substance as coal that chemistry by its magic transformation has given us the lively dyes now in vogue. It seems almost incredible that the gay colours in which ladies array themselves should have such an origin that blackness should be changed into brilliant magenta and ever admired mauve. But such being the case it becomes a subject of interest as to how this change has been wrought,—by what process it is accomplished. Coal, it is well known consists of 4 elementary bodies, carbon, hydrogen, oxygen and nitrogen: when put into retorts and subjected to dry or destructive distillation these bodies become decomposed by heat, reuniting however, in such different ways and quantities as to produce nearly fifty other substances 14 neutral bodies, 11 bases, 9 gaseous compounds, 7 solids and 6 acids. The most important of these are gas, by which our houses and streets are lighted, and gas tar which in turn produces many substances—naphthalin, ammonia and benzoin, used in dissolving guttapercha, cleaning manufactures, &c.

All these products have some use. The most valuable of these, however, is aniline, a compound of 12 parts of carbon, 7 Hydrogen and 1 nitrogen. So small is the quantity of it found among the various matters in coal tar, that its direct extraction from it would be tiresome attended by any chemical process, the tar is therefore distilled for the purpose of yielding benzoin, an oil previously mentioned. With this is mixed nitric acid which, when distilled, produces a red fluid called nitro-benzoin. On being purified, it assumes a yellow colour and imparts a fragrant odour similar to bitter almonds, for which essence it is frequently substituted. With this nitro-benzoin is mixed a weak solution of sulphuric acid and zinc filings, on which is obtained *Aniline* with many chemical substances; a change of agents is employed giving a variety of colours whose chief value consists in purity and durability. Aniline is found in other substances besides coal-tar. For many years past it has been extracted from a species of indigo plant, and has lately been discovered in a fungus, apparently the name is derived from "nila" signifying blue

in Arabic, from whence the spanish "Anil" or indigo. Already six important colours have been extracted from coal-tar and introduced generally into manufactures of mauve and purples; magenta—red, emarldine—green; picric-acid yellow; Azurine—darkblue and Azuline an imitation of Prussian Blue. This colour was discovered by M.—of Lyons, but the process by which it is made is still secret. Having noticed these different dyes it may be well to give a brief account to the means and in their formation, although this will involve dry chemical details hardly interesting to the general reader. Mauve was discovered by an English chemist—Mr. Perkins in 1857. To transform aniline into this precious dye, which is made by combining oil of aniline with sulphuric acid, it is added to bichromate of potash,—a powerful salt containing much Oxygen. By this it is Oxydised and in 10 or 12 hours the colourless fluid changes to a black resinous mass. This is thrown into a filter and washed with cold naphtha which disengages the brown resin bearing the colouring matter or mauve free: the mauve, when perfectly cleansed by washing, is dissolved in wood naphtha or alcohol and is then ready for use. To this alcoholic solution is added a little tartaric acid or Oxalic acid and boiling water, and when cold the stuffs are plunged into a bath of it.

Wool to be impregnated with this dye should be boiled in the solution and afterwards washed in sulphate of Iron and water.

The value of aniline purple is said to be £ 5 per an ounce, being equal in value of gold that a very small quantity will colour a large number of vats. Perhaps the most brilliant colour ever given to manufactures by chemists is *magenta* or aniline-red. This was the discovery of M. Verguin, a French chemist in 1860. It is prepared by heating together anhydrous (destitute of water) bichloride of tin and a mixture of aniline upon which the red colour makes its appearance. Fuchsiane, rosiene, solferine and other reds are produced by simply changing the agent used with the aniline and to render the dyes fit for use, it is only necessary to dissolve them in wood naphtha. Magenta has been obtained by other processes and

from other substances (guano, for instance) but this is the simplest and the best method.

The rich green as the name emaraldine implies is produced by printing aniline and hydrochloric acid on a cotton fabric previously passed through a solution of chlorate of Potash. The Potash is decomposed and the acid and the Oxygen being set at liberty in time Oxydises the aniline and the green is produced: after being washed in water and carefully dried the fabric is fit for use.

This colour and azurine were invented by Doctor Calvert in 1860. The latter colour—a dark blue is formed by subjecting to a weak solution of bichromate of potash a material that has been soaked in emeraldine which being oxydised changes into azurine, and lastly some years ago M. Maruns of Lyons formed a beautiful yellow dye from picric acid. Picric acid or carbozotic acid consists of bitter yellow crystals produced by the action of nitric acid on anilic or indigotic acid.

These crystals dissolved in water and a little sulphuric acid form the dye, which possesses great purity and beauty. The three most important of these dyes, mauve, magenta and picric acid have no affinity for vegitable products but for only silk and wool.

The difficulty is obviated by the animal mordants. A mordant is a body which acts as a bond between the fabric and the colouring particles having an affinity for both.

These fixtures are of immense value in dyeing as some colours are not only fixed but increased in brilliancy by their agency. Some are metallic as sulphate of iron and acetate of alumina, others animal as casein and albumen. The latter are used to fix mauve &c. To do this the colours are mixed with the mordants before printing; afterwards the action of steam coagulates the albumen causing the material to retain the dyes even when washed in hot and weak alkaline solutions. In past ages on plain well established laws and combinations of chemical science its valuable methods of practice cannot be lost to future ages as the secrets of Tyre and Rome are to us a subject of such interest, capable of influence to so great a degree the manufacturing interests will be one or which

ere long much will be written obtaining no doubt increasing and deserved attention.

Colour made to appear and disappear.

Put into a decanter some volatile spirit in which copper-filings have been dissolved and it will produce a fine blue tincture; if the bottle be stopped the colour will disappear, but when it is unstopped the colour soon returns. This may be repeated frequently.

Colour green to make.

Mix a solution of common salt and blue vitriol in water and put into this solution small plates of copper, a green precipitate gradually be found.

Colour excellent azure to make.

Take 2 oz. of quicksilver, sulphur and ammoniacal salt, each half an ounce. Grind all together and put the contents to digest in a matrass over a slow heat; increase the fire a little and when an azure fume arises remove the matrass from the fire. When cool a beautiful azure colour will be obtained.

Colouring green for walls of drawing rooms.

Take 4 lbs of Roman vitriol and pour it in a gallon of boiling water when dissolved add 2 lbs of pearl-ash and stir the mixture till the effervescence ceases then add ¼ lb. of yellow arsenic in powder and stir the whole together. Two or three coats of this are enough for a wall. The shades may be made to vary according to the proportion of the yellow arsenic used.

Combustion and Explosion.

Bruise and slightly moisten with water a few crystals of nitrate of copper, then roll them up quickly in a piece of tin foil. In about a minute the tin foil will begin to smoke and soon after take fire and explode with a slight noise.

Composition for rendering canvas, linen, and cloths durable, pliable and waterproof.

1st. To make it black. First the canvas, linen, or cloth is to be washed with hot water or cold water, the former preferable, so as to discharge the stiffning which all new textures commonly contain; when the stiffning is perfectly discharged, hang the canvas, linen or cloth up to dry; when perfectly so, it must be constantly rubbed by the hands until it becomes supple; it must then be stretched in a frame as tight as possible and the following ingredients are to be laid on with a brush for the first coat. Viz. 8 quarts of boiled linseed oil, 1½ oz. burnt umber, ¾ oz. of sugar of lead, ¼ oz. of white vitriol and 1¼ oz. of white lead. The above ingredients except white lead, must be ground fine with a small quantity of the above-mentioned oil on a stone and muller: then mix all the ingredients up with oil and add 3 oz. of lamp black, which must over slow fire in a broad iron vessel and kept stirred until all grease disappears.

In consequence of the canvas being washed and then rubbed it will appear rough and nappy the following method must then be adopted with the second coat. Viz. the same ingredients as before, except the white lead. This coat will set in a few hours; when set take a dry paint brush and work it very hard with the grain of the canvas. This will cause the nap to be smooth.

The third and last coat makes a complete jet black; with 3 gallons of boiled linseed oil, 1 oz. burnt umber, ½ oz. sugar of lead ¼ oz of white Vitriol, ½ oz. of Prussian Blue, and ¼ oz. of Verdigris. These must be all ground very fine in a small quantity of the above oil; then add 4 oz. of lamp black put through the same process of fire

as the first coat. This is to be laid on and used at discretion just as paint. Lead colour is obtained with the same ingredients as before in making the black with the addition of white lead in proportion to the shade required,

To make it green.

Yellow ochre 4 oz. Prussian Blue ¾ oz. white lead 3 oz. white vitriol ½ oz. sugar of lead ¼ oz. boiled linseed oil sufficient to make it of a thin quality so as to go through the canvas.

To make it yellow.

Yellow ochre 4 oz. burnt umber ¼ oz. white lead 6 or 7 oz. white vitriol ¼ oz. boiled linseed oil as before directed.

To make it red.

Red lead 4 oz. vermilion 2 oz. white vitriol ¼ oz. sugar of lead ¼ oz. boiled linseed oil as before.

To make it Grey.

Take white lead, a little Prussian Blue according to the shade you want; a proportion of sugar of lead and white vitriol as mentioned in the other colours and oil ditto ditto.

To make it white.

White lead 4 lbs, spirit of turpentine ¼ quarter pint, white vitriol ½ oz. sugar of lead ½ oz. oil as before.

Note The above ingredients for different colours, are given as correct as possible, but as one article may be stronger than another, which will soon be discovered in using, in that case the person working the colours may add a little or diminish as he may consider necessary.

Copper precipitation of on silver.

If a silver spoon be immersed in a solution of sulphate of copper both the metals and solution remain unaltered; but if a polished iron rod be also immersed in this liquid, so that the lower ends of each may come in contact, a precipitation of metallic copper will take place on both the articles.

Copper pure to obtain.

Let the copper of commerce be dissolved in muriatic acid and precipitate it by a polished plate of iron; the precipitate is pure copper.

Copper Black oxide of.

Take copper and dissolve it in aquafortis till saturated, then dilute the solution with water and add to it some subcarbonate of potash dissolved in water; a green precipitate will fall to the bottom of the vessel, which must be washed in several hot waters; when settled pour off the superfluous water and place the green deposit on a piece of blotting paper supported upon a piece of coarse open canvas, and tied upon the mouth of a large water pan; after the precipitate has been thus drained it shall be taken off the canvas and made perfectly dry, by placing the paper on powdered chalk laid in a drawer and put before the fire when dry, calcine it in a crucible placed in a charcoal fire and throw it red hot into cold water, and dry it at the

bottom of a basin before a fire: this is a beautiful black oxide of copper.

Copper Green oxide of.

Take a saturated solution of copper in aquafortis, and precipitate it with subcarbonate of potash; then wash it several times in boiling water, filter and dry.

Copper fulminating.

Dissolve some pure copper in diluted nitric acid and pour into it some liquid ammonia so long as it deposits a precipitate. Pour the solution into an evaporating dish and dry it on a very low heat less than that of boiling water, when the precipitate is in a moist state then lower the heat until it becomes quite dry. This powder may be exploded in a similar way as the fulminating silver.

Coral branches artificial to make.

Take clear rosin, dissolve it in a brass pan, to every ounce of which add two drs. of the finest vermilion when stirred well together and melted, choose twigs and branches previously well dried and paint them over with the above composition. In the same manner white coral may be prepared with white lead, and black, with lamp black.

Crayons chalk red.

A quantity of humatite is ground in porphyry mortar, with clear water, until it be extremely divided, so as to form an impalpable powder. This powder is again diffused in a quantity of water sufficient to allow the finer parts of the mixture to be passed through a fine sieve, placed above a large vessel filled with water. The liquid holding the humatite in suspension is then agitated, and after

this, allowed to rest for 24 hours. At the end of this time there is formed at the bottom of the vessel a deposit of humatite, in the form of an impalpable powder; the water is then decanted from it.

1. For soft red crayons, which leave broad traces, 18 grs. of dry gum Arabic to 1 oz. of the prepared humatite.

2. For hard crayons 21 grs. of gum to 1 oz. of the powder.

3. For still harder 22 grs. of gum to 1 oz. powder.

4. For the hardest 27 grs. of gum to 1 oz. powder.

5. For crayons which leave shining traces 36 grs. of isinglass to 1 oz. of prepared humatite. The isinglass is to be dissolved separately in a sufficient quantity of water, and their solutions passed through a linen cloth; the humatite powder is then added. The liquid is brought near to a gentle fire until the mass is somewhat thickened by the evaporation of the water; when it is to be removed from the fire. The mixture is then to be carefully ground in a porphyry slab, to render it as intimate as possible and then is ready to be formed into crayons. To effect this, the mass when it has become of a proper consistence, is forced through a cylinder, the sticks thus formed are allowed to dry and then divided into crayons about 2 inches long. They are then sharpened at their points, and the hard crust which had formed upon them while drying, is removed.

Crayons are made of bone-ash powder mixed with spermaceti, adding there the colouring matters. The proper proportion is 3 oz. of spermaceti to 1lb of the bone-ash powder. The spermaceti is first to be dissolved in a pint of boiling water and the whole to be wel ground together with as much of the colouring matter as may be necessary for the shade of the colour wanted. They are then to be rolled up in proper form, and gradually dried upon a board.

Crayons coloured, to prepare. Take a large vessel of water, and put some whiting into it and mix them well together: let this stand about half a minute then pour off the liquid into another vessel, and throw the grethy sediment away: do this once or twice, until all grethiness is got rid of: then let the whiting settle and decant the water: with this whiting any colour may be mixed as required. All colours of a grethy nature must undergo the same process as the whiting.

Cream of tartar from Tamarind leaves preparation of. Tamarind leaves (rubbed to coarse powder 1 lb, dried before the sun or on a stove) divide into two portions, and boil each separately in porcelain vessels in a quart of water stirring constantly for 20 minutes, strain while hot and press. To the hot liquor of one add solution of carbonate of potash to neutrallization: strain if necessary now and mix the contents of both vessels, and boil for 10 or 15 minutes with a little moist white clay free from lime.

Strain while hot, and set aside for crystallization.

Crystallization Instantaneous. Dissolve one ounce of sulphate of soda in two ounces of boiling water; pour it while hot into a phial, and cork it close. In this state it will remain liquid; but if the cork be removed, the crystallization will commence and proceed very rapidly. Should the crystallization not commence, drop into the solution a crystal of sulphate of soda and the whole will instantly commence shooting into beautiful crystals.

Detonating balls and Pullaways. For preparing the above. 50 grs. of powdered lunar caustic are thrown, in small quantities at a time into an ounce of a mixture composed of equal parts of nitric acid and spirit of wine. An action commences, accompanied with the disengagement of red fumes during which a white powder is deposited and when this has taken place, water must be poured on to put a stop to it.

The detonating powder may also be procured by dissolving 30 grs. of pure silver in an ounce of diluted acid, (equal measures of acid and water) and adding after the solution is completed, 2 oz. of alcohol by the application of a very slight heat, the powder is deposited; but the moment it appears more spirit of wine must be put in to prevent the action from becoming too violent. The powder thus formed must be collected on a filter and dried by exposure to the air. Detonating balls are prepared by wrapping up about $\frac{1}{4}$ of a grain into a piece of fine paper with a dried pea; this when thrown on the floor, is instantly exploded. Pull-aways are formed by putting a little of the powder with sand between two pieces of thick paper and securing these together by pasting another piece of paper round that part containing the powder. When drawn asunder, the friction is sufficient to cause explosion.

Depilatory Turkish.

Take 15 oz. of quicklime and 3 oz. of orpiment, reduce them separately to fine powder; mix well and sift. If this is found too strong add $\frac{1}{3}$ part of starch powder and form the whole into a paste with warm water.

Diamonds the largest most commonly known, an account of.

The largest known is in the possession of the Rajah of Mattan in the Mallay peninsula. It is of the purest water and weighs 367 carats (4 grs.= 1 carat) being upwards of 3 oz. troy. It is shaped like an egg with an indented hollow near the smaller end. It was found at Landak about a hundred years ago and has been in the Mattan family for about 100 years. A Governor of Batavia, offered 150,000 dollars for it besides two war brigs with their guns, and ammunition together with a certain number of great guns and a quantity of powder and shot.

The diamond once in the possession of the mongul Emperor weighed 279 carats and was reckoned worth upwards of 40 lacs of Rupees (400,000 £).

That of the Emperor, of Russia weighs 193 carats, it is said to be of the size of a pigeon's egg and to have been bought for 9 lacs of Rupees (90,000 £.) besides an annuity to the Greek merchant 40,000 Rupees (4,000 £.) It is said that the above diamond formed one of the eyes of the famous idol of Shringan, in the temple of Brahma, and that a French Grenadier, who had deserted into the Malabar service, found the means of robbing the pagoda of this precious gem and escaped with it to Madras, where he disposed of it to a ship captain for 20,000 Rupees (2,000 £.) who resold it to a Jew for one lac and twenty thousand Rupees (12,000 £.) from him it was transferred for a large sum to the Greek Merchant.

That of the Emperor of Austria which weighs 139 carats, has a slightly yellowish hue; but it is valued at 10 lacs (100,000 £.)

That of the King of France, though it weighs only 136 carats is valued at 16 lacs (160,000 £.) on account of its shape and brilliancy.

That of the Queen of Portugal weighs 120 carats. That of Shah Soojah the celebrated diamond named " Koh-i-noor " or mountain of light weighs 279 carats and is valued at 78,15,525 Rupees.

Dutch Pink from wood, to prepare.

Boil the stems of wood in alum water and then mix the liquor with clay, marl or chalk which will become charged with the colour of the decoction. When the earthy-matter has acquired consistence, form it into small cakes and expose them to dry.

Dye of a blue colour.

Dissolve 1 part of indigo in 4 parts of concentrated sulphuric acid; to the solution add 1 part of dry carbonate of potash and then dilute it with 8 times its weight of water. The cloth previously must be boiled for an hour in a solution containing 5 parts of alum and 3 of tartar for every 32 parts of cloth. It is then to be thrown into a water bath previously prepared containing a greater or less proportion of diluted sulphate of indigo, according to the shade required. In this bath it must be boiled till it has acquired the desired tint. The only colouring matters, employed in dyeing blue, are wood and indigo. Indigo has a very strong affinity for wool, silk, cotton and linen. Every kind of cloth therefore may be dyed with it without the assistance of any mordant whatever. But indigo can only be applied to cloth in a solution and the only solvent known is sulphuric acid. The liquid sulphate of indigo is frequently called Saxon blue. It is not the only solution of that pigment employed in dyeing. By far the most common method is to deprive the indigo of its blue colour, and reduce it to green, and then to

dissolve it in water by means of alkalies. Two different methods are employed for the purpose. The first is to mix with the indigo a solution of green oxide of iron and different metallic sulphurets. If therefore indigo, lime, green sulphate of iron are mixed together in water, the indigo gradually loses its blue colour, becomes green, and is dissolved. The second method is to mix the indigo in water, with certain vegetable substances which readily undergoes fermentation; the indigo is dissolved by means of quicklime which is added to the solution. The first of these methods is usually followed in dyeing woollens and silks.

In the dyeing, wood and bran are commonly employed as vegetable ferments and lime is the solvent of the green base of indigo. Wood itself contains a colouring principle similar to that of indigo, and by following the common process indigo may be extracted from it. When the cloth is just taken out of the vat, it is of a green colour; but it soon becomes blue. It ought to be carefully washed to remove the uncombined particles. This solution of indigo is liable to two inconveniences; first it is apt to run too fast into the putrid fermentation; this may be known by the putrid vapours which it exhales and by the disappearance of the green colour. This inconvenience is remedied by adding more lime. Secondly sometimes the fermentation goes on too languidly. This defect may be remedied by adding more bran in order to diminish the proportion of thick lime.

Dye to, silks crimson, red, &c.

Silk is usually dyed red with cochineal or carthamus and sometimes with Brazil wood, madder is scarcely ever used for this purpose because it does not yield a colour bright enough. Silk may be dyed crimson by steeping it in the usual way in a cochineal bath. Silk cannot be dyed a full scarlet, but a colour approaching to it may be obtained by first impregnating the stuff with nitro-murio-sulphate of tin and afterwards dyeing it in a bath composed of 4 parts of cochenial and 4 parts of coercitron bark. To give the colour more body both the mordant and the dye may be repeated.

Dye to, linens and cottons red, scarlet, &c.

Cotton and linen are dyed red with madder. The cloth is first impregnated with oil, then with galls and lastly with alum. It is then boiled for an hour in a decoction of madder, which is commonly mixed with a quantity of blood. After the cloth is dyed it is plunged into a soda ley, in order to brighten the colour. The red given by this process is very permanent, and when properly conducted, it is exceedingly beautiful. The whole difficulty consists in the application of the mordants, which is by far the most complicated employed in the whole art of dyeing. Cotton may be dyed scarlet, by means of murio-sulphate of tin, cochineal, and quercitron bark, and as for silks; but the colour is too fading to be of any value.

Dye to, woollens red, crimson, and scarlet.

Coarse woollen stuffs are dyed red with madder or archil; but fine cloth is almost exclusively dyed with cochineal, though the colour which it receives from the kermes is much more durable. Brazil wood is scarcely used, except as an auxiliary, because the colour which it imparts to wool is not permanent. Wool is dyed crimson by first impregnating it with alumini, by means of an alum bath and then boiling it in a decoction of cochineal till it has acquired the wished for colour. The crimson will be finer if the tin mordant is substituted for alum; indeed it is usual with dyers to add a little nitro-muriate of tin when they want fine crimsons. The addition of archil and potash to the cochineal, both render the crimson darker and give it more bloom; but the bloom very soon vanishes. For paler crimsons 1½ of the cochineal is withdrawn and madder substituted in its place. Wool may be dyed scarlet, by first in a solution of murio-sulphate of tin; then dyeing it pale-yellow, with quercitron bark, and afterwards crimson with cochineal; scarlet is a compound colour, consisting of crimson mixed with a little yellow.

Dye to, woollens black.

Wool is dyed black by the following process. It is boiled for 2 hours in a decoction of nut galls and afterwards kept for two hours more in a bath composed of log-wood and sulphate of iron, kept during the whole time at a scalding heat but not boiling. During the operation it must frequently be exposed to the air; because the green oxide of which the sulphate is composed, must be converted into red oxide by absorbing oxygen, before the cloth can acquire a proper colour. The common proportions are 5 parts of galls, 5 of sulphate of iron, and 30 of log-wood for 100 of cloth. A little acetate of copper is commonly added to the sulphate of iron, as it improves the colour.

Dye Black to, Silks.

Silk is dyed nearly in the same manner. It is capable of combining with a great deal of tan. The quantity given is varied at the pleasure of the artists by allowing the silk to remain a longer or a shorter time in the decoction.

Dye to, woollens, &c. a brown.

Brown or fawn colour, though in fact is a compound, is usually ranked among the simple colours because it is applied to cloth by a simple process. Various substances are used for brown dyes. Walnut peels, or the green covering of the walnut when first separated are white internally but soon assume a brown or even a black colour, on exposure to the air. They readily yield their colouring matter to water. They are usually kept in large casks covered with water for above a year before they are used. To dye wool brown with them nothing more is necessary than to steep the cloth in a decoction of them till it has acquired the wished for colour: the depth of the shade is proportional to the strength of the decoction.

The root of the walnut tree contains the same colouring matter but in a small quantity. The bark of the birch also may be used for the same purpose.

Dye green.

Wools, silks and linens are usually dyed green, by giving them first a blue colour and afterwards dyeing them yellow; when the yellow is first given, several inconveniences follow; the yellow partly separates again in the blue vat, and communicates a green. When sulphate of indigo is employed it is usual to mix all the ingredients together, and to dye the cloth at once; this produces what is known by the name of Saxon green.

Dye to, a silk shawl scarlet.

First dissolve 2 oz. of white soap in boiling water, handle the shawl through this liquor, now and then rubbing such places with the hand as may appear dirty till it is as clean as this water will make it. A second or even a third liquor may be used if required. The shawl must be rinsed in warm water. Then take half an ounce of the best Spanish anotto and dissolve it in hot water; pour this solution into a pan of warm water and handle the shawl through this for a quarter of an hour; then take it out and rinse it in clean water. In the meanwhile dissolve a piece of alum of the size of a horse-bean in warm water and let the shawl in this $\frac{1}{2}$ an hour; take it out and rinse it in clear water. Then boil $\frac{1}{4}$ oz. of the best cochineal for 20 minutes, dip it out of the copper into a pan and let the shawl remain in this from 20 minutes to half an hour, which will make it blood-red. Take out the shawl, and add to the liquor in the pan a quart more of that out of the copper, if there is too much remaining, and about half a small wine-glass-full of the solution of tin; when cold, rinse it slightly out in spring water.

Dye to, a silk Shawl crimson.

Take a table spoonful of cud Bear, put it into a small pan, pour boiling water upon it, stir and let it stand for a few minutes, then put the shawl in and turn it over a short time and when the colour is full enough, take it out; but if it should require more violet or crimson, add a spoonful or two of purple archil to some warm water, and dry it within doors. To finish it, it must be mangled.

Dye woollens yellow.

Wool may be dyed yellow by the following process; let it be boiled for an hour or more with $\frac{1}{6}$ of its weight of alum, dissolved in a sufficient quantity of water as a mordant. It is then to be plunged, without being rinsed, into a bath of warm water containing as much quercitron bark as equals the weight of the alum employed as a mordant. The cloth is to be turned through the boiling liquid, till it has acquired the intended colour.

Then a quantity of clean powdered chalk equal to the hundredth part of the weight of the cloth is to be stirred in and the operation of dyeing continued 8 or 10 minutes longer.

By this method a pretty deep and lively yellow may be given. For a very bright orange or golden yellow, it is necessary to use the oxide of tin as a mordant. For producing bright golden yellow, some alum must be added along with the tin. To give the yellow a delicate green shade, tartar must be added in different proportions according to the required shade.

Dye silks yellow.

Silk may be dyed of different shades of yellow either by weld or quercitron bark; but the last is the cheaper of the two. The proportions should be from 1 to 2 parts of barks, to 12 parts of silk according to the shade. The bark tied up in a bag, should be put

into the dyeing vessel whilst the water which it contains is cold ; and when it has acquired the heat of about 100° the silk having been previously alumed should be dipped in and continued, till it assumes the wished for colour. When the shade is required to be deep, a little chalk or pearl-ash should be added towards the end of the operation.

Dyeing Turkey Red.

Dr. Thomson's process.

The cloth is steeped in a weak alkaline lie, to remove the weaver's dressing. This is technically called the rot *steep*. From 4 to 5 lbs. of caustic potassa are generally used for every one hundred lbs. of cloth.

The temperature of the solution is from 100° to 120°. The cloth is kept in the steep for 24 hours and then well washed.

2. From seven to ten lb. of carbonate of soda are dissolved in a sufficient quantity of water to keep the cloth always supposed to be one hundred lbs. wet—in this solution the cloth is boiled for some time.

3. It is upon the 3rd process that the beauty of the colour depends than any other. Without it the dye cannot be produced on new cloth. But when old cotton cloth that has been frequently washed—cotton shirt, for example, is to be dyed, this process may be omitted altogether. A liquor is composed of the following compounds.

One gallon gallipoli oil, one gallon and a half of soft sheep's dung ; four gallons of a solution of carbonate of soda of the specific gravity 1·06; one gallon of solution of pearl-ashes of specific gravity 1·04.

These to be mixed up with a sufficient quantity of cold water to make the whole mixture amount to 22 gallons. The specific gravity of the liquor should be from 1.020 to 1.025.

The menstruum has a milk white appearance and is in fact a kind of imperfect soap. It is put into a large, wooden, open cylindrical vessel called the liquor *tub* and is kept constantly in motion, to prevent subsidence, by wooden levers driven round in it by machinery. This liquor is conveyed by tin pipes to a kind of trough in what is called the padding machine where the cloth is throughly soaked in it. The longer it is allowed to remain impregnated with this solution, the better does it take the dye. Fourteen days is the least period that this impregnation is allowed to remain.

The padding machine is similar in principle to that employed for starching.

The sheep dung gives the cloth a green colour, and is found materially to assist the bleaching process to which it is afterwards subjected. It is found to increase the rapidity of the bleaching especially when the cloth is exposed on the grass between the different operations.

4. In favourable weather, the cloth impregnated with the imperfect soap No 3. is spread upon the grass to dry. But in rainy weather it is dried in the stove. This method of exiccating dyed and printed goods is similar to that in Calico printing.

5. The cloth thus exiccated is a second time impregnated with the oleaginous liquid No 3. It is then dried again. The impregnation and drying repeated a third time.

6. The cloth is steeped in a weak solution of pearl-ash of a specific gravity from 1. 0075. to 1·01, heated to the temperature of 120°. From this liquor it is wrung out and again dried.

7. A mixture is made of the following substances:—One gallon gallipoli oil, three gallons soda lie, of specific gravity 1. 04 diluted with as much water as will make up the whole 22 gallons. In this liquid the cloth is soaked as in that of No 3—The cloth thus impregnated is dried on the grass, in rainy weather in the stove.

8. The process No 7 is repeated thrice, and after each soaking the cloth is exposed for some hours on the grass and finally dried in the stove.

9. The cloth is steeped in a mixed lie of pearl-ash and soda, of the specific gravity 1. 01 to 1. 0125, heated to the temperature of 120°. It is allowed to drain some hours, and then well washed; it is then dried in the stove. The object of this process is to remove any superfluous oils which might adhere to the cloth. Should any such oil be present, the succeeding process, the galling, could not be accomplished.

10. For the galling, 18 lb of Aleppo-galls to be boiled for 4 or 5 hours in 25 gallons of water, till the bulk is reduced to about 22 gallons. This liquid after straining is strong enough to impregnate one hundred lb. of cloth with the requisite quantity of nut-galls. Of late years Sumach from Sicily has been substituted for nut-galls; thirty three lb. of the former being reckoned equivalent to 18 lb. of the latter. Sometimes a mixture of nine lb. of nut galls and sixteen lb. and a half of sumach is employed.

In this liquor heated to 80° or 100° the cloth is fully soaked. The sumach gives the cloth a yellow colour which serves to improve the madder-red by rendering it more lively.

11. The next step is to fix the alumina on the cloth. This process is essential because without it the madder dye will not remain but be washed off by water.

In England alum is used by the manufacturers, but in many parts of the continent, acetate of alumina is employed. To form the alum liquor of the Turkey-red dyer, to a solution of alum of the specific gravity 1. 04, as much pearl-ash, soda or chalk is added, as is sufficient, to precipitate the alumina contained in the alum.

Through this muddy liquor, which should have a temperature from 100° to 120°, the cloth is passed and steeped for 12 hours. The alumina is imbibed by the cloth and combines with its fibres.

12. The cloth thus united with alumina is stove dried, and then washed out of the alum liquor.

13. These essential preliminary steps being taken, the cloth is ready to receive the red-dye.

From one to three lb. of madder reduced to the state of powder are employed for every lb. of cloth the quantity depending upon the shade of color required. The cloth is entered into the boiler while the water is cold. It is made to boil in an hour and then boiling continues for 2 hours. During the whole of this time the cloth is passed through the dyeing liquor by means of the winch.

For every 25 lb. of cloth dyed, one gallon of bullock's blood is added. This is the quantity of cloth dyed at once in a boiler. The addition of the blood is indispensable to obtain a fine red colour; many attempts have been made unsuccessfully to leave this out. It seems probable that the colouring matter of blood is fixed on the cloth. Its scarlet tint would doubtless improve the colour of madder-red.

14. Madder-brown, by this process is fixed on the cloth as well as Madder-purple or madder-red. This gives the cloth a brownish-red and rather disagreeable color. But the brown tinge not being nearly so fixed as the red it is got rid of altogether by the next process which is known by the name of clearing process.

The cloth is boiled for 12 or 14 hours in a mixture of 5 lbs. of soda, 8 lb of soap, and from 16 to 18 lb galls of the residual liquid No. 9 with a sufficient quantity of water. By this seething, the brown colouring matter is mostly removed, and the cloth begins to assume the fine tint which characterizes Turkey-red dye cloth. It is still further improved by the following process.

15. Five or six lb of soap and from 16 to 18 ounces of protochloride of tin in crystals, are dissolved in water in a globular boiler, into which the cloth is put. The boiler is then covered with a lid which fits close and the ebullition is conducted under the pressure

of two atmospheres or at a temperature of 250° 5°. The boiler is furnished with a safety valve and a small conical pipe, the extremity of which has an opening of about $\frac{3}{10}$ of an inch in diameter from which there issues a constant stream of steam during the operation. The salt of tin is found materially to improve the color. Probably the oxide of tin combines with the oleaginous acid of the soap, fixed in the cloth. This insoluble soap doubtless unites with the red colouring matter of madder, and alters the shade.

After all these processes the cloth is spread out on the grass and exposed to the sun for a few days which finishes the clearing.

The following must be attended to by the Turkey-red dyer.

1st Brightening. 17½ lb. of Carbonate of potassa, 4½lb of white soap should be mixed with water, and cloth must be boiled in this liquid for 5 hours.

2nd. 17½ lb. of soap, 3½ lb. of Carbonate of potassa and 1 lb. of Chloride of tin should be mixed with water and the liquid to be brought to ebullition. The cloth to be dyed is to remain therein 5 or 6 hours.

3rd. 9lb. of soap, 14 ounces of Carbonate of potassa, 14 ounces chloride of tin are mixed with water and the cloth to be boiled in this mixture for 5 hours.

Dyes, various, methods for preparing.

Annotto to prepare.—Into 2 gallons of water put 1lb. annnotto, 4 oz. of pearl-ash and 2 oz. soft soap and apply heat and stir until the whole is dissolved. When convenient it is best to boil the solution.

Catechu to prepare.—To seven or eight gallons of water put one pound of Catechu, and boil till all is dissolved, then add 2 oz. of sul-

phate of copper, and stir when it is ready for use. Nitrate of copper may also be used, taking one glassful of the solution prepared as under.

To one measure of nitric acid and two parts of water, add metallic copper so long as the acid will dissolve it ; then bottle the solution for use.

To make sulphate of Indigo.—Into five pounds of most concentrated sulphuric acid stir in by degrees one pound of the best Indigo finely ground. Expose this mixture to a heat of about 160° for 10 or 12 hours stirring it occasionally ; a little rubbed over a window pane should assume a purple blue colour.

This preparaion is sold in the market in the state of a paste, under the name of Indigo extract which is prepared by proceeding exactly as stated for sulphate of Indigo, and then diluted with about four gallons of hot water and the whole put upon a woollen filter, until it passes through nearly colourless ; the blackish matter retained upon the filter is thrown away and the solution, passed through, is transferred to a leaden vessel and evaporated to about three gallons to which is added about four pounds of chloride of sodium, and well stirred; the whole is again put upon a woollen filter, and allowed to drain. The extract remains as a thin pasty mass upon the filter, and is ready for use.

Red Liquor, to make.—Into one gallon hot water place two pounds of alum; dissolve in a separate vessel two pounds of acetate of lead in one gallon of water; in a third vessel dissolve ½ a pound crystallized soda; mix all the solutions together, and stir well for some time then allow to stand over night, decant the pure solution, which is ready for use.

Caustic Potassa, to make.—To three gallons of water add two pounds either black or pearl-ashes, and boil when seething, add

newly slaked lime, until a small quantity taken out does not effervesce when an acid is added to it. To do this take a tumbler half filled with cold water, take out a table spoonful of the boiling lie and put into the tumbler and a few drops of sulphuric-acid added to the hot lie; the addition of acid causes no effervescence, the boiling and adding of lime is stopped and the whole allowed to settle; then remove the clear liquid into the vessel having a cover to prevent it taking carbonic acid from the air. This serves as a stock for general use. The lime sediment remaining may have some hot water added, which will give a strong lie and may be used for first boils for yarn or heavy cloth.

Caustic Soda, to make.—For every gallon of water add one pound of soda ash, or two pounds of crystallized soda of the shops; boil and proceed by adding slaked lime, and testing as for potassa; boiling for sometime is essential to insure causticity.

Bleaching liquor, to make.—Take a quantity of bleaching powder, and add to it as much water as will make it into a thin cream; take a flat piece of wood, and break all the small pieces by pressing them against the side of the vessel, then add two gallons of cold water for every pound of powder, stir well, put a cover upon the vessel, and allow the whole to settle. This will form a sort of stock vat for bleaching operations.

A sour, to make.—To every gallon of water add one gallon of sulphuric acid, stir thoroughly; goods steeped into this should be covered with the liquor, as pieces exposed become dry, which deteriorates the fibres if left under the liquor, the cloth is not

hurt by being long in the sour; but on being taken out every care should be taken to take out of the liquor thoroughly, otherwise the goods will be made tender.

Cochineal liquor, to make.—Put 8 oz. of ground cochineal into a bottle, and add to it 8 oz. by measure, ammonia and 8 oz. water; let the whole simmer together for a few hours when the liquor is ready for use.

Iron liquor.—Put pieces of iron, or filings into pyroligneous acid and allow it to stand for several days, stirring occasionally; a gentle heat assists the action.

A Blue vat, to make.—Take one pound of Indigo and grind in water until no grittiness can be felt between the fingers, put this into a deep vessel—casks are generally used, with about twelve gallons of water, then add 2 pounds of copperas and 3 pounds of newly slaked lime, and stir for fifteen minutes; stir again after two hours for five or six hours; towards the end the liquor should be of a greenish yellow colour with blackish veins through it, and a rich broth of indigo on the surface, after standing eight hours to settle, the vat is fit for use.

Oil and Iron stains, to remove.—Take a little hydrochloric acid in a basin or saucer and make it slightly warm; then dip the iron stain with the acid for about one minute which will dissolve the oxide of iron. The cloth must be well washed, from this, first in water, then in a little soda and water so as to remove all trace of acid. A little oxalic acid may be used instead of hydrochloric acid but more time is required and with old fixed

spots is not so effective. The same precautions are necessary in washing out the acid, as oxalic acid dried, on the cloth, injures it.

Mildew, to remove from cotton.—First steep cotton in soap or soda and water, then put the goods into bleaching liquor, wash and pass through sour and wash.

Indellible ink marks, to remove.—Steep the marking into a little chlorine water, or a weak solution of bleaching liquor for about half an hour, then wash in ammonia water which will obliterate the stain. The goods to be washed from this in clean water or they may also be removed by spreading the cloth with the ink mark over a basin filled with hot water, then moisten the ink with the tincture of iodine with a solution of hyposulphite of soda, or caustic potassa or soda, until the colour is removed; then let the cloth dip into the hot water—after a while, wash well and dry.

Animal and vegetable fibres, to detect.—Treat the fabric with bichloride of tin heated to from 130° to 150°, when the cotton and linen become black and wool and silk remain unchanged.

Common black dye for cotton (10 lb. *in weight.*)—Steep the goods in 3 lb. of sumach while it is hot and let them lie over night; wring out and work for 10 minutes through lime water, then work for ½ an hour in a solution of 2 lb. of copperas. They may either be washed from this or brought again through lime water for 10 minutes.

The former gives the preferable shade; but must be well fused; work them for ½ an hour in a warm decoction of 3 lb. logwood adding ½ pint of chamber lie; before entering the goods lift and raise with two ounces of copperas in solution, work 10 minutes, then wash and dry.

Jet Black.—The goods are treated exactly as last; but along with the logwood is added one pound fustic, and finished as above.

Blue Black.—Dye the goods first a good shade of *Blue* by the vat and then proceed exactly as for common black, but should the blue be very deep as is often the case then half the quantity of the materials given above will suffice.

Spirit Brown. The goods are dyed 1st a spirit yellow and washed, they are then wrought for ½ an hour in a decoction of lima or peach wood and 1 lb. logwood, lift up with three ounces of alum in solution, and work fifteen minutes; wash and dry. By varying the proportions of logwood and lima wood a variety of shades can be produced.

Mordant Brown.—Dye a yellow, then work for half an hour through a decoction of 2 lb lima wood and 8 ounces logwood, lift and raise with 2 oz. of alum in solution, work for 15 minutes and wash and dry.

Cinnamon Brown.—Dye a dark spirit-yellow and then work for twenty minutes in a decoction of one pound of lima wood and one pound of fustic, lift and raise, by adding ½ pint of red liquor, work 10 minutes in this, wash in cold water and dry.

French and Pearl white.—Into hot water dissolve a quantity of white soap as much as makes a lather, and then add about ½ oz. by measure, archil; work the goods in this for 10 minutes and push out the soap and a little cud bear may be used instead of archil more or less according to the shade required.

Another method.—Into a vessel of cold water, add about one ounce by measure of plumb liquor; work the goods for 10 minutes in it, wash out and dry.

Light straw colour.—To a tub of cold water add 4 oz. of acetate of lead previously dissolved; work the goods through this for fifteen minutes, and wring out, into another tub of water add two ounces bichromate of potassa; work the goods through this ten minutes, wring out and pass again through the lead solution for ten minutes; wash and dry.

Lemon colour.—Into a tub of cold water put one lb. of acetate of lead, previously dissolved, work the goods in this for fifteen minutes and wring out into another tub of cold water, put 6 ounces of bichromate of potassa in solution, work the goods for fifteen minutes through this, and wring out, then put back, and work ten minutes in the plumbous solution, wring out and dry.

Deep yellow.—To a tub of cold water add one lb. of acetate of lead and one pound of nitrate of lead in solution, work the goods in this for half an hour and wring out then in a tub of warm water; add twelve ounces of chrome and work the goods from the lead through this for fifteen minutes; expose to the air for half an hour and then pass again through the lead and chrome working the same time in each as before, and allow an hour's exposure out of the chrome

the second time, then pass through the lead; wring out, wash and dry. If not deep enough, a third dip may be given, observing the same rules.

Deep amber yellow.—Put into a tub of water one pound acetate of lead, and to this add gradually caustic potassa or soda until the precipitate formed be re-dissolved taking care not to add more alkali than is required for this solution. The goods are then wrought through this for half an hour; wring out, and then add eight ounces of chrome to another tub of water, and work the goods in this for fifteen minutes; wring out, wash and dry. Two or three ounces of sulphate of zinc may be added to the chrome solution with good effect. If a red-deep amber be required, add to the chrome solution one half pint muriatic acid.

Chrome Green.—Dye the vat blue; then on the top of the blue, dye yellow by the last recipe, of course the depth of the blue and yellow will regulate the tint of green, so that the proportions named for the yellow may be smaller and the dips or immersions repeated more or less required. The principal difficulty is, when a particular depth or shade of green is wanted, to ascertain the exact shade of blue to be given, as blue cannot be given upon the yellow. This is a matter indeed, which can only be learned by practice; but very short experience will suffice. The dyeing must be performed in a boiling state.

Purple.—Work the goods half an hour in a bath with one ounce of chrome, one ounce alum, lift out, and wash in cold water; then work half an hour in a bath with three pounds fustic, one and a half pounds cam-wood, one pound log-wood; lift out and dry.

Rich Green Drab.—To the dye add one ounce bichromate of potash, half an ounce alum tartar and work the goods in this half an hour,

lift out and wash through cold water, and add four ounces of log-wood, two ounces of fustic, one ounce bar wood or ½ an ounce peach wood; work the goods again through the second bath half an hour; wash and dry.

Iron Buff or Nankin.—Take two pounds of sulphate of Iron and dissolve them in warm water, and then add the requisite quantity of water for working the goods, work in this for twenty minutes and writhing out put them immediately into a separate vessel filled with lime water, and work in this for fifteen minutes writhing out, and expose it to the air for half an hour, when the goods will assume a buff colour. If the colour is not sufficiently deep, this operation may be repeated, working through the same copperas solution, but using fresh lime water every time. The goods are then washed through clean water, and dried.

Chloride of Iron.—This is another salt and is seen in the dye house. It is prepared for use thus. To four pounds of hydrochloric acid add two parts of water, and apply a gentle heat then add iron in pieces or filings so long as it continues to be dissolved, then pour off the clear liquid into a basin, and evaporate, when greenish coloured crystals of chloride will be obtained; but this salt crystallizes with difficulty and quesces in the air and should not be exposed. Instead of evaporating and crystallizing, the solution may be put into a bottle and served for use.

This salt is used for dyeing silks and woollens of a deep blue, and preferred for that purpose to copperas.

Five pounds of silk to dye a rich deep blue.—Add to water, required to work the silk, two pints of the solution of chloride of iron and one pint of double muriate, or chloride of tin, work in this half an hour; lift and work in a solution of eight ounces of Ferrocyanide. If the colour be now of the required depth wash out in water in which two

ounces of alum have been dissolved ; but if not sufficiently deep, put it again through the iron and Ferrocyanide solutions, and then wash out.

Nitrate of Iron. Take 4 lb. of nitric acid and one part water in a glass or stone ware vessel and place it in a warm solution then add clean iron so long as the acid continues to dissolve it with effervescence. The fumes are dangerous.

For sky blue.—The cotton should be previously bleached then to a tub of cold water, sufficient to work the goods in easily, add half a pint nitrate of iron and then work in this for twenty minutes ; wring out and pass through one tub of cold water. Into another tub of cold water add 4 oz. of Ferrocyanide of potassium in solution and about a wine glass full of sulphuric acid : work the goods in this for 15 minutes, wring out and wash through cold water, in which is dissolved one ounce of alum ; wring out and dry.

Nankeen and Buff colours.—Are dyed directly upon cotton by the nitrate of Iron. To a tub of hot water add one pint of nitrate of iron and work out in this for half an hour ten pounds of cotton previously bleached ; wash out in water and dry. No process can be more simple and easy and this produces a permanent dye.

Red spirits.—Are made by mixing together in a stone ware vessel three parts by measure hydrochloric acid and one part water and adding to this in small quantities at a time feathered tin, till about two ounces tin, to the pound of the acid used, are dissolved. In this operation the temperature should not be allowed to rise.

Eggs to preserve fresh.

Apply with a brush a solution of gum arabic to the shells and then dry them in dry charcoal dust.

Eggs to preserve, another method.

Mix together in a tub 1 bushell of quick lime; 32 oz. of salt, 8 oz. of cream of tartar, with so much water as will reduce the composition to a sufficient consistence to float an egg. Keep the eggs therein and they will remain fresh for about a twelve month.

Egg shell, to engrave on.

Trace all your designs on the shell with tallow taking care to see that the objects designed are well covered with it. Then dip the egg for a while either in strong vinegar or dilute acid which will corrode the parts not covered with the tallow, thus you will obtain beautiful raised designs having all the appearance of being itched or engraved.

Enamel Fritz, to prepare.

Calcine 30 parts of lead with 33 parts of tin. Then take of this compound oxide 50 lb. and as much powdered flints (prepared by being thrown, into water when red hot) and then ground to powder, add 8 oz. of salt of tartar; melt the mixture in a strong fire kept up for 10 hours after which reduce the mass to powder.

Enamel Fritz, to make it white.

Mix 6 lb. of the above compound with 48 gr. of the best oxide of manganese and melt it in a clean fire. When fully fused, throw it into cold water, then re-melt and cool as before; repeat the process for 3 or 4 times till the enamel is quite white.

Enamel rich red-coloured.

This colour may be obtained with the powder of cassins, which must be melted with the fritz as before.

Enamel rich Green to make.

Take copper dust 1 oz. sand 2 oz. litharge 1 oz. nitre ½ oz. or copper 2 oz. sand 1 oz. litharge 2. oz., nitre 1½ oz. mix them with an equal quantity of flux and melt them.

Enamel rich black.

Take of calcined iron and cobalt each 1 oz. or zaffer 2 oz. and manganese 1 oz. mix with equal part of flux, grind and then melt them.

Enamel rich Yellow.

Take of lead and tin ashes, litharge, antimony and sand each 1 oz. and nitre 4 oz. calcine or melt them together, pulverize and mix them with an equal part of flux.

Enamel rich Blue.

Take of prepared cobalt, sand, red lead and nitre each one ounce, flint glass 2 oz. melt them and treat as above with the flux.

Enamel rich purple.

Take the purest gold, dissolve it in aqua regia, regulated with salammoniac, put it in a sand bath for 48 hours, collect the powder

grind it with 6 times its weight of sulphur, put it into a mortar and rub it together for about 6 hours, with the addition of a little water, which change frequently, evoporate the remaining mercury in a crucible and add to the powder 10 times its weight of flux.

Enamels, General rules to be observed in making.

Powder, sift and grind all the colours very nicely, and first mix them with one another and then with the flux, then set them in pots in a furnace and when they are well incorporated, cast them into water and when dry, set them in a furnace again to melt and when melted take a proof of them. If too deep coloured, add a little more of the flux ; if too pale add more colour.

Enamel colours preparation of.

The different qualities, or degrees of purity in the ingredients as usually met with, while following the same preparations, produce nevertheless some slight variations in their effects ; but the best enamel colours may always be obtained with certainty by careful attention to the following directions.

When metals are dissolved, these solutions should always be perfectly saturated. In making they should be sufficiently melted in the crucibles, to flow liquid and pour out easily.

The various quantities of the materials ought to be the purest possible; It is better to make a few ounces of each colour at a time, and they must all be ground as soon as made, in water, with a glass muller on a piece of plate glass, then be dried before the fire, scraped off in powder, and kept in bottles for use. When used for painting they are ground in sprits of turpentine.

Preparation of the materials.—Take pices of flint, which have been burnt white, make them clean with hot water and a brush, then

throw them heated red hot, into cold water after having thus treated them two or three times, pulverize them in a wedge wood war mortar and then grind them in water on a piece of glass.

Red sulphate of iron.—Sulphate of iron or green vitriol is to be prepared and placed in an earthen ware muffle, till the mixture is evaporated and a grey powder left, which put into a crucible placed on a charcoal fire and stir with a bar or rod of steel till it gets of a fine red colour then let it fall out of crucible into a pan of cold water; when settled at the bottom of the pan, wash it in several waters and then dry it for use. The more it is burnt the darker is the red.

Brown Sulphate of iron.—Take sulphate of iron, in lumps and calcine it in a red charcoal heat, till it becomes of a deep brown colour, let it cool in the crucible and afterwards wash it repeatedly in hot water.

Black Oxide of copper.—Take copper and dissolve it in aquafortis till saturated, then dilute the solution with water and add to it some sub-carbonate of potash, dissolved in water, a green precipitate will fall to the bottom of the vessel, which must be washed in several hot waters; when settled, pour off the superfluous water and place the green deposit on a piece of blotting paper, supported upon a piece of coarse open canvas and tied over the mouth of a large earthen pan; after the precipitate has been thus drained, it should be taken off the canvas and made perfectly dry, by placing the paper in powdered chalk, laid in a drawer and put before the fire. When dry, calcine it in a crucible, placed in a charcoal fire and throw it red hot into cold water and dry it at the bottom of a basin before a fire; this is a beautiful black oxide of copper.

Green Oxide of copper.—Take a saturated solution of copper in aquafortis and precipitate it with subcarbonate of potash; then wash it several times in boiling water, filter and dry.

White Oxide of tin.—Into a small box with a sliding cover, chalked all over inside, pour melted tin, from a ladle, close and shake the box till the tin becomes finely granulated then wash and dry it and put

it into a clean Florence flask and pour over it strong nitrous acid, a white precipitate will be deposited, wash this as before, dry and bottle it for use. This is white oxide of tin.

Black Oxide of cobalt.—Take good metallic cobalt and dissolve it to saturation in nitric acid, diluted with a little water ; put this into a sand bath ; then pour the solution into a large basin and having added a quantity of water to it, pour into it a solution of subcarbonate of soda, as long as any precipitate falls down ; when settled, pour off the water, wash and dry, mix it in a biscuit ware mortar, with a pestle of the same with three times its weight of dry nitre ; put the mixture into a warm crucible and drop into it an ignited piece of charcoal, some slight explosions will then take place, and when these have ceased make the calx red hot ; this after being washed and dried is the best oxide of cobalt for Enamel, and is capable of forming various colours simple and compound.

Fluxes.

In forming these take great care to mix all the ingredients accurately in a biscuit ware mortar with a pestle of the same material and powder them as finely as possible. Let the crucible be made warm before the fluxes are put into them, by placing them in the fire with the mouth downwards which will prevent their breaking in the fire.

Flux No. 1.—Red lead 8 parts, Calcined borax 1½ do., flint powder 2 do., flint glass 16 do.

Flux No. 2.—Flint glass 10 parts, white arsenic 1 do., nitre 1 do.

Flux No. 3.—Red lead 1 part, flint glass 3 parts.

Flux No. 4.—Red lead 9·5 parts, Borax not calcined 5·5 parts, flint glass 8 parts.

Flux No. 5.—Flint glass 6 parts.—Flux No. 2.—4 parts, Red lead 8 parts.

Flux No. 6.— Flux No. 2—10 parts, Borax 4 parts, Flint powder 1·25 parts.

Flux No. 7.—Flux No. 4.—6 parts, colcothar 1 part.

Flux No. 8.—Red lead 6 parts, Borax not calcined 4 parts, Flint powder 2 parts.

After the fluxes have been melted they should either be poured upon a stone, wetted with a sponge or into a large pan of clean water; they should then be dried and finely powdered in a biscuit ware mortar for use.

Yellow Enamel,—Red lead 8 parts, Oxide of antimony 1 part, white Oxide of tin 1 part.—Mix the ingredients in a biscuit ware mortar and having put them on a piece of Dutch tale in the muffle make it gradually red hot and suffer it to cool.

Take of the above mixture 1 part, Flux no. 4—1·5 parts; grind them in water for use. By varying the proportion of red lead and antimony, different shades of colour may be obtained

Enamel, Another yelllow.—Take three parts by weight of sheet lead and 1 part of block tin, melt them together in a ladle and skim off the top as fast as it oxidizes. When a sufficient quantity is thus obtained, place it in the muffle to calcine any remaining particles of metal.—Of which take 7·5 parts, oxide of antimony 1 part, litharge 1 part.

Mix these well together and give them a red heat in a muffle sufficient to bind them together but not to melt them. Use the same flux as for the other yellow.

Enamel Orange.—Red lead 12 parts, red sulphate of iron 1 part, oxide of antimony 4 parts, flint powder 3 parts well mixed together in the mortar and heated so as to adhere together, but avoid melting.

Take of the above 1 part, Flux No. 7.—2·5 parts. Grind for use.

Do. Dark red.—Brown sulphate of iron 1 part, flux No. 7.—2·5 parts white lead 1·5 parts, grind for use.

Enamel Red borax.—Brown sulphate of iron 1 part, flux No. 1—3 parts. Grind for use.

Do. Vandyke brown.—Flux No. 4—3 parts, Iron filings 1 part, melted together in a crucible and drawn out with tongs.

Take of the above 5 parts, Black Oxide of Cobalt 1 part: Grind for use.

Enamel Brown another.—Manganese 2·5 parts, Red lead 8·5 parts, Flint powder 4 parts heated so as to stick together. Of this mixture take 1·5 parts, Flux No. 4.—1 part.—Iron filings 1·5 parts. Grind for use.

Do. Black for painting and mixing with other colours.—Umber broken into small pieces and calcined in yellow heat in a crucible till quite black, then washed in boiling water and dried.

Of this take 10 parts, black oxide of cobalt 10·5 parts, blue flint glass 10·5 parts, borax calcined 7·5 parts, red lead 12 parts. Heat these well together.

Take of the above 2 parts, flux No. 4.—1 part. Grind in water for use.

Blacks are compounded in other proportions of these ingredients and manganese is sometimes substituted in the place of umber.

Enamel Black another.—Umber calcined black 1 part, black oxide of cobalt 1·5 parts, black oxide of copper · 5 part, Flux No. 4—3 parts. Grind these in water and when dried, place them on a piece of Dutch talc in a muffle, in a charcoal fire and heat them so as to bind them together, then add half a part of Flux. No. 4. These blacks, if soft are hardened by adding a little black oxide of cobalt.

Enamel black for shading and drawing under the greens.

Manganese 5 parts, royal smalt 1 part. Ground fine in water and heated to a high degree in a muffle.

Enamels transparent, a frit for.—Flint powder 3 parts flux No. 2—3 parts, green-pot metal-glass 1½ parts, red lead 7 ½ parts, borax calcined 2½ parts, green oxide of copper 1¼ parts. Melt them in a crucible, pour out the mass, and powder it in an earthen ware mortar.

Enamel Green.—Take of green frit 3 parts, yellow enamel 1½ parts. If too soft, add Naple's yellow, grind in water for use.

Green enamel another.—Green frit 5 parts, flux No. 2—5 parts, flux No. 6.—2·5 parts. Grind in water for use.

Greens for painting in enamel, are formed of various shades by mixing blue and yellow—blue and orange in different proportions.

Enamel Blue.—Black Oxide of cobalt 4 parts, Flint powder 9 parts, Nitre 13 parts. Mix the ingredients well in an earthen ware mortar and heat them in a crucible in a strong fire of coke and charcoal till perfectly melted; then powder the mass, wash it in cold water and dry it. If these are not sufficiently fluid in the melted state to be poured out of the crucible, the mass will adhere to a piece of steel bar, when it is warm, and may easily be drawn out.

Of this take 1 part, flux No. 5—1 part, grind in water for use.

Enamel Blue another. Take black oxide of cobalt 1 part, borax uncalcined 1 part. Melt them together. Of this take 2 parts, blue-pot metal-glass 10 parts, Red lead 5 parts, melt them in fire. If either blue is too soft, add a little royal smalt, a little flux made of blue glass 2 parts, borax 1 part.

Purple enamel. Take *fine* gold from the refiners and dissolve it to saturation in an aquaregia made as follows.

Of the strongest nitric acid 1 part by measure, distilled water 3 parts, muriatic acid 3 parts. Make the solution in a clean Florence oil-flask placed on sand near the fire. Pour melted tin into cold water to granulate and dissolve it to saturation in diluted aqua-regia 4 parts. Place the tin and the acid in a large basin covered with an earthen plate in a temperate heat, when the tin is all dissolved, add still more tin, and also strong red fuming nitrous acid 1½ parts; and again dissolve the tin to saturation covering the basin with the plate, to prevent the fumes from escaping. After standing 24 hours a little distilled water should be poured into the basin. The solution of tin may then be put into a clean phial

for use, adding to it a few grains of tin for use, examine it, after 4 or 5 days when the solution, if carefully made, will be of a fine clear dark colour and fit to make purple with. Then, of the solution of gold take sufficient to make with distilled water of a fair yellow colour and drop gradually into it the solution of tin till the last added drops occasion no turpidness in the liquor, and a most beautiful purple precipitate will immediately be formed which must be thrown, as it is made, into a large vessel and two or three pieces of the granulated tin should be put at the bottom of the vessel. The precipitate is then to be washed in several hot waters, filtered on the blotting paper and while in a moist state, is to be melted with the flux number 4. finely powdered. The proportion of the flux to the purple precipitate is always various, and is judged of by the mass being of good rich-dark colour, as the ingredients are ground together on a plate glass. Care must be taken to grind the colour before it gets dry. Twenty four grs. of gold made into a precipitate in this manner will take eight of flux ; and this may be a rule to the experienced practitioner.

Enamel rose coloured. To a saturated solution of gold in aquaregia (containing 24 grains of gold) diluted with 100 times its bulk of warm distilled water, having 20 grains of alum dissolved in it; add caustic ammonia, drop by drop, as long as any precipitate is thrown down. This precipitate is to be washed in several hot water.

To 24 grs. of gold, precipitated in this manner add flux no 4. —2 oz., flux no 3.—2 oz. Mix them together, wet and grind them on a plate glass, adding by a leaf at a time 16 leaves of leaf silver; when the whole is ground fine, let it be dried on the glass, scraped often, and putt into the bottle for use. This rose-colour on being ground turns to a grey or slate colour ; but being placed in a muffle and exposed to a gentle heat, it will turn to a red colour ; it is however, fit for use in either state, as the heat will eventually give back the rose hue. Should the rose be of a yellow hue, add a little more purple, and if too purple, add more leaf of silver.

Do. Do. another. Take purple made as before directed 1 ounce flux No. 3.—4 oz., muriate of silver 10 grs. The latter ingredient, is prepared, by dissolving silver in aquafortis, and precipitating it with common salt. Grind in water for use. If too purple, add a little more of the muriate of silver.

Enamel Opaque white. Harts horn shavings, burnt in a crucible in a charcoal fire, till perfectly white 1 part, flux No. 1—1 part.—Grind in water for use; or Venetian white cake enamel 1 part, flux No. 8—1 part.—Grind in water, for use; then heat them together in a muffle. Or flux No. 2 powdered and washed, then dried and heated in a muffle.

To Engrave on copper altoreleivo.

This is effected by drawing with common turpentine varnish mixed with lamp black; and when the varnish is thoroughly dry the acid is poured upon it.

Etching on copper.

Having provided a copper plate of the size of the drawing to be copied, rub it well with oil and chalk and a piece of flannel so as to remove perfectly all the marks and scratches of the charcoal used in polishing it, then wipe it clean. Heat the plate then and give it a very thin coating of bees' wax, taking care that it be quite level all over: then with a sharp iron point trace such designs as you wish to engrave, taking care that you make a raised edge round your plate, to prevent any liquor being poured upon it from runnig off; this edge may be about ½ an inch high. Then pour over it weak aquafortis. Let this be on the plate a short time, wiping off the bubbles, as they arise, with a feather, after which take it off, wash the plate with water; then let it dry, then examine if the plate be enough corroded; if one part be more done than other, cover that portion with lamp black and common varnish, and when dry, pour on the aquafortis again. When

done, heat the plate and wipe off the wax carefully, then polish the surface with a little oil, chalk and flannel and wipe it clean.

Feathers to colour.

The first process is to clear them from their animal oil. Take for every gallon of clean water, one pound of quick lime precipitated in fine powder, pour off the clean lime water for use, at the time it is wanted. The feather to be cleansed should be steeped in the lime water for 3 or 4 days, and then taken out and well washed in clean water afterwards dried upon a net work. After the process of steeping in lime water is over, it is better to wash them in soap water instead of simple clean water. The next process is styled bleaching, which is divided into 3 distinct operations viz. 1st. They steep the feathers, in 3 litters of hot water, just before the boiling heat which holds in solution a demi-kilo-gramme of fine whitening (spanish white) they then agitate the water strongly, leaving the feathers therein for a quarter of an hour, and stirring them from time to time, to prevent the white from precipitating. The feathers then must be finally washed in 3 different portions of water

2nd. They blue the feathers in cold water in which they have dissolved a litte indigo tied up in fine linen cloth ; this solution is but very slightly coloured; they pass the feathers through this bath, after they have been well washed.

3rd. The sulphuring is effected in the same manner as in bleaching straw.

The vessel most commonly employed in this operation is a piped cask, 3 feet high and open at both ends. About the middle of this vessel, a net, strained upon a hoop, is lodged, the hoop resting upon several nails driven into the sides of the cask for the purpose. The feathers must be laid on this net. The cask is covered with a lid that should fit it air-tight. Underneath the cask is placed a chafing dish full of burning charcoal, over which is placed a

sheet iron pan, strewed with a thin layer of sulphur. The sulphur on being heated inflames and sulphurous acid gas is disengaged which fills the inside of the vessel and bleach the feathers; 2 or 3 hours are sufficient for this operation. Care must be taken that there may not be too much sulphur, as it would then occassion a flame which might reach high and burn the feathers. The quill part of the feathers ought to be carefully covered with cloth or silk to prevent its exposure to the fumes of the sulphur.

For Rose colour.—A cold bath of safranum to which is added a little citron juice.

Coarse red. A bath of Brazil wood used boiling hot after having steeped the feathers in a solution of alum.

Crimson. After steeping the feathers in an alum solution they are steeped in a cochineal bath.

Blue of every shade. The same solutions of indigo are used for this purpose as recommended for straw.

Yellow. Aluming the feathers they are passed through a bath of wood. The compound colours, such as green, purple, blue are obtained by the usual means.

Figures in imitation of Ivory. Making isin-glass and strong brandy into a paste with powder of egg shells very finely ground, and you may give it any colour you please; but put it warm into your mould, taking care to oil it previously. Leave the figure in the mould to dry and upon taking it out you will find that it bears a strong resemblance to Ivory.

Fire Vases of scent.

Storax 2 oz., Benzoin 2 oz., Gum Juniper 2 oz., Olibanum 1 oz., Frankincense 1 oz., Amber 1 oz., Camphor 1 oz., Salt-petre 3 oz., Willow Charcoal 4 oz. The above are well ground and mixed together with the addition of a little alcohol and made into conicle pestilles, which are set on fire upon a plate.

Another Method. Storax 4 oz., Benzoin 4 oz., Frankincense 4 oz., Camphor 2 oz., or Camphor 2 oz., Gum Juniper 1 oz., Charcoal of Willow 1 oz. Method of preparation as above.

Fire, the well of.—Add gradually one ounce by mixture of sulphuric acid to 5 or 6 ounces of water then throw in an ounce of granulated zinc and a small bit or two of phosphorus; in a short time the whole will become luminous and continue in that state for some minutes.

Fire Green under water.—Put into a Glass tumbler 2 oz., of water, and add, first a piece or two of phosphorus about the size of a pea, then 30 or 40 grains of chlorate of potash then pour upon the mass by means of a funnel with a long neck which reaching to the bottom of the glass, 5 or 6 drops of sulphuric acid. As soon as the acid comes in contact with the ingredients, flashes of fire begin to dart from under the surface of the water. When this is taking place drop into the mixture a few pieces of phosphuret of lime; this will cause a stream of fire of an emerald green colour to pass through the liquid.

Fire, the miniature river of.—Let fall a few drops of phosphorised ether on a lump of loaf sugar and place the sugar in a glass of warm water; a very beautiful appearance will be increased, if the surface of the water by blowing gently with the breath, be made to undulate.

Fire White.—48 parts of nitre, 13¼ sulphur, 7¼ of sulphuret of antimony, or 24 nitre, 7 sulphur, 2 realgar or red or piment.

Fire Blue.—Four parts of gun powder meal, 2 parts of nitre, sulphur and zinc each 3 parts.

Fire Red, a new Composition of.—40 parts of nitrate of strontia, 13 of flower of sulphur, 5 of chlorate of potash and 4 of sulphuret of antimony.

Flame, mask of.

Take 6 parts of oil of olives and one of phosphorus. Suffer them to digest well together, and keep the solution together, which in the

dark will appear luminous. Then close your eyes, and lightly passing a sponge dipped in this solution over your face and hands they will appear in the dark, covered with a bluish flame.

Flame Red. In a quantity of highly rectified alcohol put in a little of muriate of strontia and a beautiful red flame will be generated.

Flame Yellow. If nitrate of Barytas be mixed with alcohol, a brilliant yellow flame will be produced.

Green flame. Put a small quantity of highly rectified spirits of wine mixed with a little boracic acid, into a sauce, and set them on fire, when beautiful green flame will be produced.

To make a flash like lightning appear in a room, when any one enters it with a lighted candle.

Dissolve camphor in alcohol and deposit the vessel containing the solution in a very close room, where the spirit of wine must be made to evaporate by speedy and strong ebullition. If any one then enters the room with a lighted candle, the air will inflame while the combustion will be sudden and of so short a duration as to occasion no danger.

Fluid Blue writing.

Dissolve 1 oz. Prussiate of Potash in 1 pint of distilled water to which add 2 drams of nitric acid and two drams of Iron (sulphate of) previously dissolved and allowed to settle.

Liquid foil for silvering Glass globes.

Melt together 1 oz. of clear lead, and 1 oz. of fine tin in a clean iron ladle, then immediately add 1 oz. bismuth. Skim off the dross, remove the ladle from the fire, and before it sets, add 10 oz. of quick silver, now stir the whole carefully together, taking care

not to breath over it, as the fumes of the mercury are very pernicious. Pour this through an earthen pipe into the globe, which turn repeatedly round.

Another Ditto. To 4 oz. of mercury add as much tin foil as will become barely fluid, when mixed. Let the globe be clean and warm and pour the amalgam in it turning it about till it is silvered all over. Let the remainder run out and hang the globe.

French Polish.

This varnish is made by dissolving pure elate shell-lac in double its quantity of well rectified spirits of wine. House-hold furniture, frames of looking glasses and pictures, gun stocks, and other articles of wood may be polished should be free from all impurities especially from oils, and pour out a little of the varnish into a saucer and with a clean rag apply a coating of it on your article; let the first coating dry, then similarly apply a second coating and if you think fit, a third; when well dry, the surface must be briskly rubbed down with pumice finely powdered, a little salad oil and chamois skin.

Fusible metal to prepare.

3 parts of lead, 2 parts of tin and 5 parts of bismuth, melted together. Articles prepared of the above metal, will fuse in being dipped in boiling water or oil.

Gems factitious.

The general vitrious body called strass, from the name of its German inventor, is prepared in the following manner.

8 oz. of pure rock crystal or flint in powder, mixed with 24 oz., of salt of tartar are to be baked and cooled. The mixture is to be afterwards poured into a basin of hot water and treated with

dilute nitric acid till it ceases to effervesce and then the frit is to be washed till the water comes off tasteless. This is to be dried and mixed with 12 oz. of fine white lead and the mixture is to be levigated and elutriated with a little distilled water. An ounce of calcinded borax being added to about 12 oz. of the preceding mixture in a dry state the whole is to be rubbed together in a porcelain mortar, melted in a clean crucible, and poured out into cold water. This vitrious matter must be dried, and melted a second and a third time, always in a new crucible and after each melting pour into cold water, as at first taking care to separate the lead that may be revived. To the third frit, ground to powder, 5 drs. nitre are to be added, and the mixture being melted for the last time, a mass of crystal will be found in the crucible of a beautiful lustre. The diamond is imitated with this base. Another very fine white crystal may be obtained from 8 oz. of white lead, 2 oz. of powdered borax, ½ grain of manganese and 3 oz. of crystal treated as above.

Oriental Ruby.

To 16 oz., of strass, add a mixture of 2 drs. and 48 grains of the precipitate of Cassius; the same quantity of golden sulphuret of antimony and of manganese calcined with nitre and 2 oz. of rock crystal.

Emerald.

To 15 oz. of strass add 1 dr. of mountain blue (Carbonate of copper) and 6 grs. of glass antimony; or to 1 oz. of strass add 20 grs. of glass antimony, and 3 grs. of oxide of cobalt.

Opal.

To 1 oz. of strass add 10 grains of horn silver, 2 grains of calcined magnetic ore and 26 grains of chalk marl.

Oriental Topaz. Is prepared by adding oxide of antimony to the base; the amethyst, by manganese with a little of the purple of Cassius; the beryl, by antimony and a very little cobalt; blue stone or sapphire by cobalt.

Yellow Diamond.

Is prepared thus. To 1 oz. of strass add 24 grs. of chlorate of silver, or 10 grains of glass antimony.

Sapphire.

To 24 oz. of strass add 2 drs. and 26 grs. of Oxide of Cobalt.

Note—The base of all artificial gems is strass, composed of silica potash, borax, oxide of lead and sometimes arsenic. The silicious matter should be perfectly pure, and if obtained from sand, it ought to be calcined and washed, first with dilute muriatic acid and then with water. The crystal or flint should be made red hot, quenched in water, and ground as in the potteries. The polish should be purified from the best pearlash, and the borax should be refined by one or two crystallizations, the oxide of lead should be absolutely free from tin. Good, red lead is preferable to litharge. The arsenic should also be pure. Hessean crucibles are the best adapted for the meltings. The fusion should be continued at least 24 hours, for more tranquil and continuous it is, the denser is the paste and greater its beauty.

Strass No. I.—Rock crystal 4056 grains, red lead 6300 grains, pure potash 2154 grains, Borax 276 grains, arsenic 12 grains.

Strass No. II.—Sand 3600 grs., pure carbonate of lead 8508 grs., potash 1260 grs., Borax 360 grs., arsenic 12 grs.

Strass No. III.—Rock crystal 3456 grains, Red lead 5328 grs., potash 1944 grs., Borax 216 grs., Arsenic 6 grs.

Strass No IV.—Rock crystal 3600 grs. pure carbonate of lead 8508 grs., potash 1260 grs., Borax 360 grs.

For to topaz.

Strass 1008 grs., Glass of antimony 43 grs., purple of Cassius 1 gr., Strass 1008 grs., or oxide of iron, called saffron of Mars 36 grs.

Ruby.

Strass 2880 grains, Oxide of manganese 72 grs.

Emerald.

Strass 4608 grains, Green Oxide of pure Copper 42 grs., Oxide of chrome 2 grs.

Sapphire.

Strass 4608 grains, Oxide of Cobalt 68 grains.

Amethyst.

Strass 4608 grains, Oxide of manganese 36 grs., Oxide of Cobalt 24 grs., purple of Cassius 1 gr.

Beryl.

Strass 3456 grs., glass of antimony 24 grs., Oxide of Cobalt 1½ grs.

Note.—In all these mixtures, the substances should be mixed by sifting, fused very carefully and cooled very slowly, after having been left in the fire from 24 to 30 hours,

Gems Artificial Paste M. Lacoun's.

Paste.—Liharge 100 grains, white sand 75 grs., white Tartar or Potash 10 grs.

Amethyst.—Paste 9216 grains, Oxide of manganese 26 grains Oxide of cobalt 1 grain.

Emerald.—Paste 9216 grains, Acetate of Copper 72 grains, oxide of Iron or Saffron of Mars 1·5 grains.

German Silver composition of.

25 parts of Nicle, 25 of zinc and 50 of Copper—Another alloy better adapted for rolling, 25 nickel, 20 zinc, and 60 copper.

On the English method of Gilding Metal Buttons.

To prepare the amalgam. A quantity of mercury is put either into a crucible or into an iron ladle, which has been previously lined with a coating of pipe clay, and exposed to heat till it begins to pass off in fumes on becoming volatilised, the gold, to be mixed with it to form the amalgam, should be previously granulated and be heated red-hot, when it is to be added to the mercury and be well stired about with an iron rod till it is perfectly amalgamated with the mercury. If there be any superfluous mercury, it may be separated by squeezing it through a clean soft chamois skin and the remaining amalgam should have then a consistence resembling that of butter and contain about 3 parts of mercury to one of gold.

On gilding with the amalgam. The buttons to be gilt must be well cleaned on their surfaces by boiling them in a very dilute nitric acid. A quantity of gilder's aquafortis is then poured into an earthen vessel and mercury put therein, when a sufficient quantity of the mercury is dissolved, the articles to be gilt must be put into the solution and be stirred about with a brush till they are white. The operation is termed quickening. Another mode of quickening is performed by dissolving the mercury in a bottle containing the aquafortis and leaving it in the open air during the solution, so that the noxious vapours escape into the atmosphere. They then pour a little solution into a basin and with a brush dipped therein wipe

over the surfaces of the metal articles to be gilt which immediately as by the first mentioned method, become coated with mercury. The amalgam is then applied in the following way; by proportioning the quantity of the amalgam to the quantity of the articles to be gilt, and putting them together into a large cap made of felt, they stir them about continually with a large soft brush, till the amalgam is uniformly diffused over their surfaces, then they are put into a broad, shallow iron pan and exposed to a gentle degree of heat over a charcoal fire; when they become hot they are frequently returned into the cap and the amalgam again spread over the surfaces of the articles with a large painter's pencil and again heated in the iron pan, which is also kept in continual agitation to cause them to be uniformly heated and to prevent the irregular dissipation of the mercury until at length they are entirely volatilised by a repetition of heating, and the gold is attached evenly to their surfaces. These gold surfaces are then cleaned by rubbing them with wire scratch brush and artists afterwards exalt the colour of the gold by the application of various compositions. This part of the process is called colouring. The following have been selected as some of the best.

A wax to exalt the colours of Red gold. To 4 oz. of yellow, melted bees' wax add in fine powder one ounce and a half of red ochre, one and half ounces of verdigris, calcined till it yields no fumes, half ounce of calcined borax, then mix them well together. The gilt articles are to be coated with the above and then heat is applied to burn off the wax.

Green gold, to exalt the colour of.

Mix saltpetre 1½ oz., salammoniac 1¼ oz., and verdigris (calcined) 18 dwts. together and dissolve a portion of the mixture in water for use.

Yellow gold, to exalt the colour of.

Take saltpetre 6 oz., Green copperas 2 oz., white vitriol and alum

each one ounce. These are also to be dissolved in water when wanted.

Note.—These two last compositions must be applied to the surfaces of the gilt works either with a pencil, or by dipping the latter into the former, a proper degree of heat must then be used to cause them to assume a black colour when they must be quenched or cooled either in vinegar or water.

Gild glass, to

Prepare first a flux in the following manner, Red lead 9·5 parts, Borax 5·5 parts, Flint glass 8 parts.

Melt the above and pour into a large pan of clear water, dry it and then finely powder it in a wedge wood mortar.

Then take of fine grain gold 1 part, of pure mercury 8 parts. Warm the mercury in a crucible and then add the gold previously making it red hot. When the gold is perfectly dissolved, pour the mixture into cold water and wash it well. Then press out the superfluous mercury through linen and chamois skin and the mercury which runs through (for it retains some gold) should be reserved for the next opportunity. The amalgam which remains in the leather is to be digested in warm aquafortis which will take up the mercury but will have the gold in the form of an extremely fine powder, it must be rubbed up with one third its weight of mercury. Then mix one grain of this amalgam with three grains of the above flux and mix in spirit of turpentine thickened with thick oil of turpentine, which is then to be applied on the glass in the usual manner.

Gild to, by burnishing.

This operation is chiefly performed on picture frames, mouldings, &c. The surface to be gilt must be carefully covered with a strong size made by boiling down pieces of parchment or kid skin

till they are reduced to a stiff jelly. This coating being dried 8 or more must be applied consisting of the same size mixed with fine plaster of Paris or elutriated chalk; when a sufficient number of layers have been put on varying according to the nature of the work, and the whole is become quite dry, a moderately thick layer must be applied composed of size and Armenian bole, or yellow oxide of lead; while this last is yet moist, the gold leaf is to be put on carefully being pressed with a roll of cotton, and before the size is become perfectly dry, those parts, which are intended to be the most brilliant, are to be carefully burnished by an agate or dog tooth fixed in a proper handle.

Ginger beer, to prepare.

Take 2 pounds of fine loaf-sugar, 8 grs. of ginger and 26 grains., of carbonate of potassa, all in fine powder. Mix them intimately in a wedge-wood ware mortar. Take also 27 grains of citric acid which is to be kept separate from mixture.

The beer is prepared from the powder in the following manner. Take two tumblers, each half filled with water, stir up the compound in one and the acid powder in the other, then mix the two liquors and effervescence immediately takes place and it must be drunk in this state.

Glaze for earthen vessels without lead.

Take nitre, potash and common salt of each ½ lb with double that quantity of pulverised glass and mix them well together then take a well baked flat earthen dish, cover it pretty thick with well heated clay; put on the dish some sand and straw, strew over it as much clay as will adhere to it, and suffer it to dry. Put the above ingredients well mixed into the dish and introduce it into the furnace in order that they may be well fused together. The dish, however, must be placed within another, in order that the ingre-

dients may not be lost, in case the dish should happen to crack; but if it be well covered with clay and carefully bestrewed with sand little danger is to be apprehended. When the ingredients, have been fused, they are to be pounded very fine and may be employed as a common glaze.

Glaze white.

Take 26 parts of glass, 7 parts litharge, 3 parts nitre, 1½ parts arsenic, ½ part blue calx. Mix these together.

Glaze yellow.

Take 2 parts litharge, 2 parts of tin ash and one part of antimony.

Glaze blue.

Take 1lb of tartar, ¼ lb red lead, ¼lb of zaffre and ¼lb powdered flints. Fuse the whole.

Glaze red.

Take 3 lb of antimony, 3 lb of lead and 1 lb of rust of Iron, grind the whole as fine as possible, then put your articles into the furnace.

Glaze green.

Take of calcined copper 1 part and 2 parts of the above mentioned yellow glaze. Fuse them twice; but when the composition is used, it must not be laid on too thick for that would render the colour too deep.

Glaze another, yellow.

Take of tin and antimony each 2 lb, calcine the whole and put

them at last in fusion that they may be vitrified. The calcining the lead and antimony together as here directed would be a very tedious operation.

Procure therefore calcined tin and lead, and calcine the antimony alone. Your operation must be performed with a slow fire, by roasting, as it were, the antimony till it loses its metallic appearance and becomes a greenish powder merely.

Glaze another yellow.

Take 4 parts of white glass, 1 part of antimony, 3 parts of red lead and 1 part of iron scales. Fuse the mixture.

Glaze another yellow.

Take 16 parts of flint, 1 part of filings of iron and 24 parts of litharge. Fuse them as above.

Glaze gold coloured.

Take of red lead and white flint each 12 parts and filings of iron 1 part. Fuse them twice.

Glue portable, to make.

Take 1 lb of the best glue and strain it very clear, boil likewise of 4 oz. of isinglass, put it in a double glue pot with ½lb of fine brown sugar and boil it pretty thick. Then pour it into moulds, when cold, cut and dry them in small pieces. This glue to be used requires to be thinned with the addition of a little water.

Glue, A strong.

Common glue dissolved with linseed oil answers well for sign-boards and out door work, as it resists any weather.

Gold powder for gilding.

Dissolve gold in nitro-muriatic acid and then precipitate it with a piece of copper, the precipitate must then be digested in distilled vinegar and then washed with pure water and dried, which will leave the metal in the form of a very fine powder.

Gold, to recover from the washings.

The water is put into a large earthen ware pan kept constantly covered and a solution of sulphate of iron is added to it, the gold soon appears in the form of impalpable powder; the process may be repeated in the same for a month or even longer taking care to leave the sediments, and throwing away the useless liquid; the solution of the sulphate of iron should be added so long as its addition produces a turpidness in the washings, when a sufficient quantity is collected, the whole is to be fused in a crucible with the addition of nitre to oxide of iron. The gold is thus obtained in a state of purity.

Gold pure, a method of obtaining.

Perfectly pure gold is obtained by dissolving the gold of commerce in nitro-muriatic acid and precipitating the metal by adding a weak solution of sulphate of iron. The precipitate after being well washed and dried is pure gold.

Gold Purple.

Dissolve 1 gr. of the best tin in a sufficient quantity of muriatic acid taking care that the solution is neutral; next 2 Grammes of tin in aqua-regia, composed of 3 parts of nitric acid and 1 of muriatic acid, observing to make the solution neutral. This solution of gold being diluted with about 3 quarts of water, the solution of protochloride of tin is to be added at once, drop by drop, till the precipitate thereby formed, acquires the wished for tint, after which it should be washed as gently as possible.

Gold purple, another method.

Let tin be set to dissolve in very dilute aqua-rdgia without heat till the liquid fluid becomes faintly opalescent, and when the metal must be taken out and weighed. The liquor is to be largely diluted with water and a dilute solution of gold and dilute sulphuric acid is to be simultaneously stirred into the nitro muriate of tin. The gold in the one solution must bear to the tin in the other as the rates of 18 to 5.

Gold work, the boil for

One part of alum, two parts of nitre and and one of common salt with a very little water are put into a crucible and made to boil. When the salts are dissolved, the articles are dipped in it from time to time and washed in water until the required effect is produced.

Gun Cotton, preparation of.

Prepare an aqua-regia composed of 2 parts of highly concentrated nitric and 1 part of equally strong sulphuric acid. Into this compound steep a quantity of cotton for a minute or two then take it out and edalcorate in cold water and dry it for use.

Grease, to extract from paper or silk.

To extract grease from paper, such as printed engravings, place some dry pipe clay in powder upon the spots on the paper and cover this with two or three folds of blotting paper. Then lay a warm flat iron upon the paper and allow it to stand for half an hour. Repeating and replacing it two or three times. The heat of the iron softens the grease and the whiting then absorbs it. For removing grease spots from high coloured silk, substitute soap, and stone dust for the whiting. Oil is very difficult to extract from paper and silk and it generally leaves a yellow stain that cannot be removed.

Gun metal.

Melt together 9 parts of copper and one part of tin. This compound is used for the manufacturing of cannons, &c.

Horn to soften.

To 1lb of wood ashes add two pounds of quick lime, put them into a quart water. Let the whole boil until reduced to one third, when it is settled, filter it and keep it for use. Shavings of horn steeped in this liquor for 3 or 4 days become perfectly soft. Your hands must be well oiled to work into a mass.

Horn moulds.

Having softened your horn as taught above, oil a medallion, and put the horn in its soft state upon it carefully pressing it down equally in all directions, when dry, it must be removed and the mould is ready for use.

To tint horn in imitation of Tortoise shell.

To tint it red, a solution of gold in a qua-regia must be employed.

To tint it black, a solution of silver in nitric acid.

To tint it Brown, a solution of mercury in nitric acid.

Note.—The brown spots can be produced on the horn by means of a paste made of red lead, with a solution of potash, which must be put in patches, on the horn, and subjected sometime to the action of heat. The deepness of the brown depends on the quality of potash used in the paste and proportioned to the length of time the mixture lies on the horn.

Phosporetted Hydrogen Gas.

Put into 5 parts of water half a part of phosphorus cut into very

small pieces with 1 of finely granulated zinc and adding 3 parts of strong sulphuric acid. The gas is disengaged in small bubbles of air and a well of fire is produced.

To gild satin, silk or ivory, &c. by Hydrogen gas.

Immerse a piece of white satin, silk or ivory in a solution of nitro-muriate of gold, in the proportion of one part of the nitro-muriate to 3 ounces of distilled water. Whilst the substance to be gilded is still wet, immerse it in a jar of hydrogen gas, it will soon be covered by a complete coat of gold.

Another Method.

Paint flowers or other ornaments with a fine brush dipped in the above solution of gold, on any article you like, hold them over a soda water bottle throwing into it a little iron filing and pouring over this some dilute sulphuric acid. The painted flowers in a few minutes will shine with all the splendour of the purest gold.

Imitation whale bones.

In manufacturing substances analogous to horn or whale bone a little more than one part by weight six to seven percent of sulphur is employed for two of caoutchouc and heat is applied over the case of vulcanized caoutchouc; but when tar is added to this manufacture it is better to have recourse to a dry than steam heat. In other respects, the articles are submitted to the ordinary vulcanizing process; only for objects intended to remain hard, the heat is continued about six hours; but merely raising temperature to 230° during the first ½ hour sustaining the temperature an hour and a half and raising it by little and little during the remainder of the time up to 300° to 320°. The sheets thus manufactured, may be united and reduced in thickness by passing them between polished cylinders of steel heated to 194° and these sheets introduced into heated moulds, receive and retain clean, neat and delicate forms.

On taking Impressions in the fusible metal.

In order to do this, the melted metal must be poured into a paste-board tray, and be kept constantly in motion while it cools and assumes a pasty consistence, the medallion must be suddenly stamped upon it.

Substitute for Indian Ink.

Six parts of isinglass are to be dissolved in twice their weight of water in boiling state; and also in two parts of water, one part Spanish liquorice. The two solutions are to be mixed, whilst hot and incorporated by a little at a time, with one part of the finest black, by the help of a spatula. When the mixture has been perfectly made, it is to be heated in a water bath, till the water is nearly evaporated and it forms a paste, to which any desired form may be given.

Indigo and various experiments with it.

Indigo is tasteless and inodorous, insoluble in water and nearly so in alcohol and ether.

It may be purified by treating successively with boiling diluted sulphuric acid and with waters which remove a glutinous matter with aqua potassa at a gentle heat, which dissolves a brown colouring matter, and with boiling alcohol, which takes up a red colouring matter, when fresh alcohol becomes no longer red, but blue, the indigo is as pure as it can be made by such means.

Indigo, purification of.

To purify indigo still further, it is digested with water, lime, and grape or starch sugar, which deoxydises or reduces the indigo, forming a soluble compound of a wine-yellow tint. This being filtered into dilute hydrochloric acid, which removes the lime, deposits pure indigo as a blue

powder. Cloth steeped in the above solution of indigo and exposed to the air is exactly dyed blue as the indigo, at the moment of being rendered insoluble, it combines with the fibre of the cloth to which it adheres very firmly, so that it cannot be washed away.

If indigo, grape sugar, soda and alcohol be digested together in proper proportions, a yellow solution is obtained, which, when exposed to air, deposits pure indigo in crystals.

Oil of vitriol dissolves indigo with a deep blue colour, forming two blue acids. This solution is much used in dying. Nitric acid, chloric acid, chromic acid, and chlorine and bromine all dissolve indigo, giving rise to oxygenised and chlorinised or brominised products, all of which are yellow and orange coloured when boiled with strong aqua potassa; indigo is also oxydised and dissolved in the form of new acids.

When placed in contact with deoxydising or reducing agents, such as proto-salts of iron and manganese or honey and grape sugar, along with an alkali such as soda, or lime, indigo is decolorised and dissolved in combination with the alkali. The addition of diluted hydrochloric acid, air being carefully excluded, precipitates reduced or white indigo.

When powdered pure indigo is added to 15 parts of oil of vitriol and gently warmed, deep blue solution is formed with water. But if only 8 or 10 parts of acid are used, the addition of water causes the deposition of a purple powder while a blue solution is obtained. The purple powder, which although insoluble in pure water is sulphopurpuric acid, The blue solution contains two acids, sulpho-indigotic and hypo-sulpho-indigotic acids. When neutralised with potash, these acids form salts, which separate from the liquid when it is saturated by any alkaline salt, such as acetate or carbonate of potash.

The two blue salts, may be separated from each other by alcohol, but the composition of the hypo-indigotate of potash is not known.

The blue solution of indigo in oil of vitriol, if diluted and digested with flannel or woollen cloth, is entirely deprived of blue colour, while the cloth is so effectually dyed that the colour cannot be washed out

It can, however, be dissolved from the cloth by carbonate of ammonia and by this means the sulpho-indigotates of ammonia, and from these the other salts of the blue acid are prepared.

Indian Rubber useful for shipwrights.

Dissolve a pound of caoutchouc in 4 gallons of rectified coal tar-naptha, in small fragments. The mixture is well stirred from time to time, till the solution becomes perfect. After 10 or 12 days when the liquid has acquired the consistence of cream, two parts by weight of shell lac are added to one of this liquid. This mixture is put into an iron vessel having a discharge pipe at the bottom and heat applied. During this operation the whole is kept stirred, and the liquid flowing out of the discharge pipe in a warm state is spread upon slates and preserved in the form of plates. When use is made of this glue, it is heated in an iron vessel to the temperature of 248° and applied hot with a brush to the surfaces to be joined, taking care to spread it in a uniform layer. The pieces of wood are brought together and firmly pressed.

If the glue should get hardened before the connection be made, it should again be softened by bringing it to the temperature of 150,° by passing iron rollers over it and the joining is quickly made.

Ink writing.

Powdered sulphate of iron 1 oz., ground logwood 1 oz., bruised galls 3 oz., gum arabic 1 oz., white wine or acetic acid 1 quart *Lewis.*

Another. Galls bruised 2lb, sulphate of Iron 5 lb, gum arabic 4 lbs, water 12 Gallons, creosote 2 drams. Boil the galls in $\frac{3}{4}$ of the water for an hour, then strain. Liquify the gum in twice its weight of water and add it to the decoction. Dissolve the copperas in the remainder of the water, mix the liquors together and finally stir in the creosote *Dr. Ure.*

Do. Aleppo galls 12lb, sulphate of iron 4 lb, gum 3½ lb, water 18 gallons *Booth.*

Fine Exchequer ink.

Aleppo galls 40 lb, sulphate of Iron 9lb, gum 10lb, water 40 gallons. The galls to be exhausted by 3 consecutive boilings each time diminishing the quantity of water and supplying by fresh addition any loss by evaporation. The copperas and gum in solution are added to the strained decoction of galls, while both are yet warm and the whole is allowed to repose for several weeks. When the fluid is drawn from the sediment. A few cloves or some drops of creosote are added to prevent any parasatic growth.

Blue-Black Ink.

A small quantity of chromate of potassa is required to convert a large amount of the decoction of logwood into the above writing fluid.

Proportion 1 part of the solution to 1000 parts of the logwood.

Marking Ink to be applied with pen.

Dissolve 100 grains of nitrate of silver, two drachms of gum arabic and one scruple of sap green in one ounce of distilled water. The linen is to be wetted before applying this, with a pounce consisting of a solution of one ounce of carbonate of soda and eight of distilled water.

Another. Dissolve 2 drchms of nitrate of silver, 6 drachms of water and 2 of mucilage while one ounce of carbonate of soda in sixteen of water together with a little sap green form the pounce.

Another. One drachm of nitrate of silver, one of mucilage in five drachms of water, tinged slightly by means of sap green. The pounce consists of carbonate of soda one ounce, gum arabic one ounce, water six ounces.

Redwood's method of marking ink.

6 Drachms of nitrate of silver dissolved in 3 drachms of distilled water and as much ammonia is added as will liquify the precipitate which it at first occasions. A little sap-green, ivory black, Indian ink or indigo, diffused through 4 drachms of mucilage of gum arabic, form the tinctorial matter, and water is added to make up the quantity 4oz.

Ink sympathetic.

Dissolve a small quantity of starch in a saucer with soft water, and use this like common ink; when dry, the writing is perfectly invisible and the letters can only be developed by a weak solution of iodine in alcohol, when they will appear of a deep purple colour.

Ink writing indelible.

Take shell-lac 2 oz, borax 1 oz, distilled or rain water 18 ounces. Boil the whole in a closely covered tin vessel stirring it occasionally with a glass rod or a small stick, until the mixture has become homogeneous.

Filter, when cold, through a single sheet of blotting paper. Mix the filtered solution with one ounce of mucilage of gum accasia (prepared by dissolving 1 oz. of gum in 2 oz. of water) and add pulverized indigo and lamp black and gluten. Boil the whole again in a covered vessel and stir the fluid well to effect the complete solution and admixture of the mucilage of gum accasia. Stir it occasionally, while it is cooling and after it has remained undisturbed for about two or three hours, that the excess of indigo and lamp black may subside, bottle it for use.

Printer's Ink.

This ink is prepared by boiling linseed oil in an iron pan, and if it does not take fire of itself, it is kindled and suffered to burn

for about half an hour. The flame is then extinguished by closely covering the vessel, and the oil is by this process found to have acquired the necessary drying quality after being again boiled. It is then mixed with a proper quantity of lamp black, when black ink is required, and with vermilion, when red.

Red Ink.

Boil 2 oz of Brazil wood, ½ oz of gum arabic and ¼ oz of alum in a pint of water for 10 minutes, strain off the decoction and set it aside to clear.

Another. Infuse 4 oz. of ground Brazil wood in vinegar for 3 days, then heat it to the boiling point and keep it for an hour at that temperature, after which it must be filtered. Whilst hot, dissolve in it ½ oz of gum arabic and the same quantity of sugar and of alum, allow it to cool, and put it into well stoppered bottles.

Another. An ink of a still more beautiful tint may be made by a decoction of cochenial to which ammonia is to be added.

Another. The most beautiful of all red inks is made by a solution of carmine in liquid ammonia allowing the excess of the alkali to evaporate and adding a small portion of white, transparent gum arabic.

Green Ink.

Boil 2 parts of verdigris and 1 of cream of tartar in eight parts of water, until it is reduced to one half. Strain it through a cloth, allow it to cool and then bottle it.

Yellow Ink.

In a quart of boiling water dissolve an ounce of alum ; add half a pound of French berries. Keep the mixture at a boiling point

for an hour, strain the liquid and dissolve in it a little more than a quarter of an ounce of gum arabic.

By following the same process, but substituting a much smaller quantity of saffron for the French berries a much more beautiful yellow will be obtained.

Autographic Ink.

White soap 100 parts, white wax of the best quality 100 parts, mutton suet 30 parts, shell lac 50 parts, mastic 50 parts, lamp-black 30 or 35 parts. The soap is first put in a goblet and melted over the fire to which the lac being added fuses immediately ; the mastic is then introduced and lastly the other ingredients.

Black writing Ink another.

Galls finely powdered 3 oz, sulphate of iron 1 oz, gum arabic 1 oz, logwood 1 oz, boiling water 1 pint ; 8 or 10 cloves to be put in powder. The whole well mixed to be exposed to the sun for at least 2 weeks, removing the moulds occasionally as they gather, when filter and bottle for use.

Gold Ink.

Gold ink is made by grinding upon a porphyry slab, with a muller, gold leaves along with white honey till they be reduced to the finest powder. The paste then be collected and put into a large glass containing clear water. The gold soon falls to the bottom, when the honey is to be repeatedly washed, till quite freed from the honey. The powder when dried is very brilliant and when to be used may be mixed with a little gum water. After the writing is quite dry, it should be burnished with agate or woolf's tooth.

Sympathetic Ink another.

Write with a diluted solution of muriate of copper and the writing will be invisible ; but on being held to the fire, it will appear of a yellow colour.

Blue Fluid.

Dissolve 1 oz. of Prussiate of Potash in one pint of distilled or rain water to which add 2 drams of nitric acid, and 2 drams of Iron (sulphate) previously dissolved and allowed to settle.

Ink Stains to remove from wood, boards, &ca.

Dilute half a tea spoonful of oil of vitriol with a large spoonful of water, and touch the part with a feather, watch it, for if it stays too long, it leaves a white mark. The best plan is to wipe out the acid with a piece of cloth almost immediately after the application, and repeat the process two or three times until the ink spot be quite removed.

Insects to preserve.

A solution of corrosive sublimate in alcohol is the best.

Irons to preserve from rust.

Melt fresh mutton suet and smear the irons over with this whilst hot, then dust it well with unslaked lime in fine powder, tied up in muslin. Irons so kept well for months, remain free from rust.

Imitation gilding for Irons.

Take of linseed oil 3 oz, tartar 2 oz, yolk of eggs boiled hard and beaten 2 oz, aloes ½ oz, saffron 5 grs, turmeric 2 grs.

Boil all these ingredients in an earthen vessel and with it wash the iron, and it will have the appearance of gold. If the mixture be thick, add a little more linseed oil.

Artificial specular Iron ore.

Equal parts of sulphate of iron and common salt are to be well mixed by rubbing them together in a mortar ; the mixture is then to be put into a shallow crucible and exposed to a red heat. When vapors no longer arise, remove the vessel and let it cool. The mass will be of a violet brown colour covered with extremely brilliant scales resembling mica ; this must be dissolved in water to get rid of the impurer portions. The fire must not be continued too long, nor must it be too violent. The scales, which remain after the washing over of the powdery parts, afford an excellent material for razor straps, when applied to the strap with a little grease previously rubbed over it.

Iron, Red sulphate of.

Sulphate of iron or green vitriol is to be powdered and placed in an earthen muffle, till the moisture is evaporated and a grey powder left, which put into a crucible placed on a charcoal fire and stir with a bar or rod of steel till it gets of a fine red colour, then let it fall out of the crucible into a pan of cold water ; when settled at the bottom of the pan, wash it in several hot waters and then dry it for use. The more it is burnt the darker is the red.

Iron, Brown sulphate of.

Take sulphate of iron, in lumps, and calcine it in a red charcoal heat, till it becomes of a deep brown colour, let it cool in the crucible and afterwards wash it repeatedly in hot water.

Isatine.

This interesting compound, which is blue indigo, is formed by digesting indigo along with water, sulphuric acid and bichromate of potash, or by heating indigo with nitric acid.

It dissolves, and the solution on evaporation deposits aurora-red crystals of isatine sparingly soluble in cold water, more soluble in hot water and in alcohol. By the action of chlorine, it yields two compounds in which hydrogen is partially replaced by chlorine. It may be volatilized if heated on a plate of metal. When acted on by a strong solution of potash, isatine is dissolved with an intense violet colour, which on addition of water and evaporation changes to yellow and the liquid deposits pale-yellow crystals, which contain potash, united to a new acid, isatinic acid formed from isatine.

When separated from its salts, by stronger acids, isatinic acid at once resolves into isatine and water; but if isatinate of lead be decomposed by sulphuretted hydrogen, and the filtered solution evaporated spontaneously in vacuo, the acid is obtained in white flocculent powder, which when dissolved in boiling water instantly becomes red, and the solution on cooling deposits crystals of isatine. The violet coloured compound first formed, when isatine acts on potash, is a compound of isatine and potash, which when heated with water soon passes into isatinate of potash.

By the action of chlorine, isatine is converted into two compounds, chlorisatine and bichlorisatine. When chlorine is passed through isatine or indigo suspended in water, by these compounds are formed, and they are separated by crystallization, chlorisatine being the least soluble of the two.

Chlorisatine forms transparent orange yellow—4 sided prisms and is very analogous to isatine in all respects. When acted on by potash there is first formed a deep red solution, which when heated soon becomes yellow, and in cooling deposits brilliant pale-yellow crystals of chlorisatinate of potash—a salt perfectly analogous to

insatinate of patash, and containing an acid, when separated from salts it is speedily re-dissolved into chlorisatine and water.

Chlorisatinate of silver forms yellow crystals, soluble in hot water; chlorisatinate of baryta forms golden yellow tables. Chlorisatinate of lead, when first precipitated from the salt of potash by nitrate of lead, forms a gelatinous yellow precipitate, which soon becomes flocculent, acquiring a splendid scarlet colour. The red salt is crystalline, the yellow amorphous. Chlorisatinate of copper forms at first a brownish yellow, bulky precipitate, which soon changes to a heavy granular blood-red powder.

Ivory paper to prepare.

Take a quarter pound of clean parchment cuttings and put them into a two quart pan with nearly as much water as it will hold. Boil the mixture gently for 4 or 5 hours, adding water from time to time to supply the place of that drawn off by evaporation; then carefully strain off the liquor from the dregs through a cloth, and when cold it will form strong jelly, which may be called size No. 1.

Return the dregs of the preceding process into the pan, fill it up with water, and again boil it as before for 4 or 5 hours, then strain off the liquor and call it size No. 2.

Take 3 sheets of drawing paper, wet them on both sides with a soft sponge dipped in water and join them together with the size No. 2. When they are still wet, lay them on a table, and place upon them a smooth slab of writing slate (without its wooden frame) turn up the edges of the paper and glue them on; then allow the paper to dry gradually. Wet, as before, 3 more sheets and glue them on the others, one at a time, carefully removing all air bubbles by wiping from the centre out-wardly. Cut off with a knife what projets beyond the slate, and when the whole has become perfectly dry, with any smooth, flat rubber make the surface of the paper quite even and smooth. After this rub it with fine

glass-paper, which will produce a very fine smooth surface. Now take ½ pint of the size No. 1. Melt it by a gentle heat and stir into it 3 table spoons-ful of fine plaster of Paris. When the mixture is completed pour it out on the paper and with a soft sponge distribute it as evenly over the surface as possible. Then allow the surface to dry slowly, then rub it again with fine glass-paper Lastly take a few spoonsful of the size No. 1 and mix with it ¾ its quantity of water, unite the two by a gentle heat, and, when the mass has cooled so as to be in a semigelatinous state pour about ⅓ of it on the surface of the paper and spread it evenly with a wet sponge. When this has dried, pour on another portion in the same manner and spread it; and afterwards the remainder, and diffuse it uniformly. When the whole has again become dry, rub it over lightly with fine glass-paper and the process is completed, then it may be cut away from the slab of slate, and is ready for use. The quantity of ingredients above mentioned is sufficient for a piece of paper 17 ½ inch by 15 ½.

Ivory to tint black.

Lay the ivory for several hours, in a dilute solution of neutral nitrate of pure silver, with access of light, it will assume black, and deeper black may be obtained by boiling the ivory for some time in a strained decoction of log wood, and then steeping it in a solution of red sulphate or red acetate of iron.

Ivory to tinge green. This colour is imparted to ivory by a solution of copper or verdigris in aquafortis; or by grinding together two parts of verdigris and one of salammoniac.

Ivory to tinge purple. Take 4 oz of aqua-regia and one of salammoniac.

Ivory to tinge blue. Ivory may be stained blue by first tinging it with green and then dipping it into a hot and strong solution of pearl—ashes.

Japan for Leather.

Black Japan for leather is prepared by mixing lamp black with a proper quantity of a strong solution of gum lac in alcohol. The thicker part of the varnish which settles at the bottom is used with the lamp black for the first coatings and the mixture applied at different times in a hot room, one layer after another, till a full body of colour is obtained after which the piece is washed over similarly, several times with the finer part of the varnish just tinged with the black so as to make a coating of sufficient thickness to bear polishing with tripoli.

Do. Black to make.

Take of boiled linseed oil 1 gallon, umber 6 oz. asphaltum 3 oz., oil of turpentine as much as will reduce it to the thickness required.

Do. for wood or matals.

When wood or leather to be jappanned the first process is to lay two or three coats of coarse varnish composed in the following manner.

Take of rectified spirits of wine one pint and course seed lac and resin each two ounces. Dissolve the seed lac and resin in the spirit and then strain off the varnish. This varnish, as well as all others, formed of spirits of wine, must be laid on in a warm place, and if it can be conveniently managed, the piece of work to be varnished should be made warm likewise ; and for the same reason all dampness should be avoided, for cold and moisture chill this kind of varnish and prevent its taking a proper hold of the substance on which it is laid.

Do. grounds white.

Take white lead washed over and ground with a sixth of its weight of starch and then dried ; temper it properly for spreading with

mastic varnish. Lay this on the body to be japanned and then varnish it over with 5 or 6 coats of the following varnish. Provide any quantity of the best seedlac and pick out of it all the clearest and best grains, say about 2 oz., and of gum anime 3 oz. and dissolve them, being previously reduced to a gross powder in about a quart of spirits of wine and strain off the clear varnish.

Do. Blue grounds.

These may be formed of bright Prussian blue, mixed with shell-lac varnish and brought to a polishing state by 5 or 6 coats of varnish of seed-lac. For scarlet use vermilion, or carmine; for yellow, use kings yellow; for green, mix Prussian blue and kings yellow, and so on. Black grounds may be formed of either ivory or lamp black, but the former is preferable when it can be obtained good. These may be always laid on with shell-lac varnish and have then upper and polishing coats of common seed-lac varnish. For forming the common black japan grounds by means of heat on metal, the piece of work to be japanned must be painted on with drying oil, and when it is of moderate dryness, must be put into a stove of such a degree of heat as will change the oil to black without burning it so as to destroy or weaken its tenacity. The stove should not be hot when the work is put into it, nor again the heat increased too pert, either of which errors would make it blister but the slower the heat is augmented and the longer it is continued provided it be restrained within the due degree the harder will be the coat of japan. This kind of varnish requires no polish having received when properly managed, a sufficient one from the heat.

A tortoise shell may be prepared in the following manner; take of good linseed oil 1 gallon and of umber ½ a pound; boil them together till the oil becomes very brown and thick, strain it then through a coarse cloth, and set it again to boil, in which state it must be continued till it acquires a pitchy consistence when it will be fit for use.

Having prepared thus the varnish, clean well the metal surface which is to be japanned and then lay vermilion tempered with shell-

lac varnish, or with drying oil diluted with oil of turpentine very thinly on the places intended to imitate the more transparent parts of the tortoise shell.

When the vermilion is dry, brush over the whole with the black varnish tempered to a due consistence with turpentine oil, and when it is set and firm, put the work into a stove, where it may undergo a very strong heat, and be continued a considerable time, if even three weeks or a month it will be the better.

The last and finishing part of japanning lies in the laying on and polishing the outer coats of varnish which are necessary as well as in the pieces that have only one ground of colour as with those that are painted. This is in general best done with common seed-lac varnish which for the above purpose may be prepared as follows.

Take of seed-lac 3 oz. and put it into water to free it from the sticks and filth that are frequently intermixed with it and which must be done by stirring it about and then pouring off the water and adding fresh quantity in order to repeat the operation till it be freed from all impurities, dry it then and powder it grossly and put it with a pint of rectified alcohol into a bottle of which it will not fill above two thirds, shake the mixture well together, and place the bottle in a gentle heat till the seed-lac be dissolved. The shaking being in the mean time repeated as often as may be convenient and then pour off that can be obtained clear by this method and strain the remainder through a coarse cloth.

The varnish thus prepared must be kept for use in a bottle well stopped.

When the spirit of wine is very strong it will dissolve a greater proportion of the seed-lac. In order to render weak rectified spirits of the first degree of strength treat it in the manner following. Take a pint of the common rectified spirit of wine and put it into a bottle of which it will not fill above three parts, add to it half an ounce of pearl-ashes, salt of tartar, or any other alkaline salt, heated red hot

and powdered as well as it can be without much of its heat. Shake the mixture frequently for the space of half an hour before which time a great part of the phlegm will be separated from the spirit and will appear together with the undissolved part of the salts at the bottom of the bottle. Let the spirit then be poured off or freed from the phlegm and salts by means of a funnel and let half an ounce of pearl ashes heated and powdered as before, be added to it and the same treatment repeated.

This may be done a third time if the quantity of phlegm separated by the addition of the alkali appear to be considerable. An ounce of alum reduced to powder and made hot but not burnt, must then be put into the spirit and suffered to remain some hours, the bottle being frequently shaken after which the spirit being poured off from it will be fit for use. The pieces of work to be varnished should be placed near a fire or in a room where there is a stove and made perfectly dry ; and then the varnish may be rubbed over them by the proper brushes made expressly for that use, taking care not to cross one part twice.

When one coat is dry another must be laid over it and this must be continued at least 5 or 6 times or more ; if on trial these be not of a sufficient thickness of varnish to bear the polish without laying bare the ground colour underneath. When a sufficient number of coats is thus laid on, the work is fit to be polished which must be done by rubbing it with a rag dipped in pumice stone finely powdered ; but towards the end of rubbing a little oil of any kind should be used along with the powder and when the work appears sufficiently bright and glossy, it should then be rubbed with the oil alone to clear it from the powder and give it a still brighter lustre. In the case of white grounds instead of the pumice, fine putty or whiting must be used both of which should be washed over to prevent the danger of injuring the work from any sand or other gritty matter that may happen to be mixed with them.

Lacquering the exterior of Iron ordnance.—Coal tar 2½ lb, spirits of turpentine 8 oz, paint dry Prussian blue 8 drs, Bee's wax, 8 drs.

The above is sufficient to give two coats to ten 24 pounders of guns.

Lacquer, an English for brass or silver.

Take 2 oz. of seed lac, 2 oz. of yellow umber, 40 grs. of dragons blood, 30 grs. of saffron and 40 oz. of alcohol, let the whole infuse and digest in a matrass, upon a gentle sand bath frequently stirring them from time to time when the gums are dissolved, the varnish must be passed through a fine white linen cloth, and be put into a well corked phial.

Note.—As the success of this varnish greatly depends upon the manner in which it is employed, so the brass must be perfectly clean and for this purpose it may be dipped in aquafortis and well washed. The brass, thus prepared must be heated so hot, that the hand can hardly bear to touch it, when the laquer is to be immediately applied.

Lacquer Excellent gold coloured for copper and brass.

2 oz. of gum lac, 2 oz. yellow umber, 40 grs. of dragon's blood, in tears ½ dr. of saffron and 40 ounce of alcohol infuse and digest in the usual manner and then strain through a linen cloth. The piece to be varnished must previously be heated.

Lacquer gold.

Put into a new 4 gallon tin bottle 1 lb of ground turmeric, 1½ oz. of powdered gamboge, 3½ lb of powdered gum sandrac, ¾ lb of shell-lac and 2 galls of spirits of wine. After being agitated, dissolved and strained add 1 pint of turpentine varnish well mixed.

Laquer for brass.

To a pint of rectified spirits of wine put one ounce of turmeric powder, two drams of best annotto and two drams of saffron; let the whole stand for 10 or 12 days in a warm place, shaking the bottle often during the interim; then filter the liquid through coarse muslin into a clean bottle, and add 3 ounces of clear seed lac and shake the bottle frequently for 10 days more, when it will be fit for use. A coating of this laid on brass gives it the appearance of gold.

Lake Yellow.

Boil a little turmeric powder with a solution of alum and pour the filtered decoction upon pounded chalk. The yellow powder with a little solution of gum arabic may be made into cakes for use.

Lake madder, preparation of.

Enclose 2 oz. Troy weight of the finest dutch madder in a bag capable of containing 3 or 4 times that quantity and made of strong fine calico. Put it into a large marble mortar and pour on it a pint of distilled water. With a pestle press the bag strongly in every direction and as it were, rub and pound it as much as can be done without injuring the bag. The water will very soon be loaded with the colouring matter and is to be quite opaque and muddy. Pour off the water, then add another part of water to the root and agitate and beat it as before, and repeat the operation so long as any colouring matter continues to come off.

About 5 pints of water, if well agitated and rubbed will extract from the root nearly the whole of its colour. The water loaded with the colouring matter must be put into an earthen or well tinned

copper and heated till it just boils. It must be then poured into a large bowl and 1 oz. troy weight of alum, dissolved in 1 pint of distilled water must be poured into it and stirred until throughly mixed. About 1½ oz. of a saturated solution of mild vegitable alkali should be gently poured in stirring the whole all the time. A considerable effervescsence will take place and an immediate precipitation of the colour. The whole should be suffered to stand till cold and the clear yellow liquor may then be decanted. A quart of boiling distilled water should now be poured on the red precipitate and well stirred when cool, the colour must be separated from the liquor by filtration through blotting paper in the usual way; and boiling water should be poured on it in the filter, till it passes through of a light straw colour and quite free from any alkaline taste. The colour may now be gently dried.

Lake from Brazil wood, to make.

Boil 4 oz. of Brazil wood in 15 pints of pure water, till the liquor is reduced to 2 pints. It will be of a dark red colour inclining to violet; but the addition of 4 or 5 oz. of alum will give it a hue inclining to rose colour. When the liquor has been strained through a piece of linen cloth, if 4 oz. of carbonate of soda be gradually added the colour will resume its former tint, and deposit a lake which when washed, and properly dried has an exceedingly rich and mellow violet red colour.

Note.—By the same process a very beautiful lake may be extracted from a decoction of logwood. In general lakes of all colours and of all shades may be extracted from substances which give up their colouring part to boiling water.

Lake Carminated from madder.

Boil 1 part of madder in from 12 to 15 parts of water, and continue the ebullition till it be reduced to about 2 pounds. Then strain the

decoction through a piece of strong linen cloth, which must be well squeezed, and add to the decoction 4 oz. of alum. The tint will be a very beautiful bright red which the matter will retain if it be mixed with proper clay. In this case expose the thick liquor, which is thus produced on a linen filter and subject it to one washing to remove the alum.

Do. fine red, to make.

Stick lac boiled in water, the decoction filtered and evaporated to dryness, yields a beautiful red lake.

Do. Orange, to make.

Boil 4 oz. of the best anotto and 1 lb of pearlashes half an hour in a gallon of water and strain the solution through blotting paper. Mix gradually with this 1½ lb of alum in another gallon of water. desisting when no ebullion attends the mixture. Treat the sediments in the manner already directed for other kinds of lake and dry it insquare bits or layers.

Do. Yellow, to make.

Take 1lb of turmeric root in fine powder and 3 pints of water, and 1 oz. of salt of tartar ; put all into a glazed earthen vessel, and boil them together over a clean gentle fire, till the water appears highly impregnated and stains paper to a beautiful yellow. Filter this liquor and gradually add to it a strong solution of roch alum, in water, till the yellow matter be left behind. Wash it with fresh water, till the water comes off insipid and then is obtained the beautiful yellow lake, called the lake of turmeric.

Do. another, do. do.

Make a ley of potash and lime sufficiently strong; in this boil gently fresh broom flowers till they are white, then take out the

flowers, and put the ley to boil in earthen vessel over the fire; add as much alum as the liquor will dissolve; then employ this ley into a vessel of clean water, and it will give a yellow colour at the bottom, settle and decant off the clear liquor. Wash the powder, which is found at the bottom, with more water, till all the salts of the ley are washed off, then separate the yellow matter and dry it in the shade.

Lamp without a flame.

The action between alcohol and some of the metals, particularly platinum, is remarkable. When a small piece of thin platinum leaf suspended by a wire is heated by a spirit lamp and quickly put into a glass in which there is a little alcohol, so as to leave it just over the surface, and of course in the vapour arising from it, it continues red hot as long as there is any fluid in the jar, which is owing to the vapour undergoing a sort of combustion and generating heat sufficient to keep the metal in that state. Hence the lamp without a flame, which is merely a common spirit lamp; but having a spiral platinum wire, about the thickness of $\frac{1}{50}$ part of an inch, placed round the wick; but not in contact with it. On kindling the spirit platinum becomes red hot and on extinguishing the flame, the vapour, coming off, keeps it ignited, so that, on applying a metal, the same kindles it, which also sets the spirit on fire.

Lances, various.

Lances are long rockets of small diameter, made with cartridge paper. They are charged by the hand without any mould.

White Lance.—16 parts of nitre, 8 of sulphur, gun powder 3 parts.

Bluish white Lance.—16 parts of nitre, 1 of sulpur, 4 of antimony.

Yellow white Lance.—16 parts of nitre, 16 gnn powder, 8 sulpur and 8 umber.

Darker yellow.—16 parts of nitre, 16 gun powder, 4 sulphur, 4 umber and 3 of colophony.

Greenish yellow.—16 parts of nitre, 6 sulphur, 6 antimony, 6 verdigris.

Pink yellow.—16 parts of nitre, 3 gun powder, 1 lamp black.

Leather Covers of Books to marble.

Wash the cover with weak potash water and give it a coat of glaze made with white of eggs. When the cover is dry, with the feather parts of 3 or 4 quills tied together so as to form a rude brush; sprinkle water on it on all directions and immediately sprinkle with copperas water and brown. Let the marbling remain a few minutes, and then wash it with clean sponge and water. Copperas water is made by simply dissolving a little copperas in water, and the brown is prepared by dissolving half a pound of the best potash in one quart of rain water.

Another kind.

Wash the cover with strong potash water, glare it, throw on water, use the vinegar black and lastly throw on a fine sprinkle of vitriol water, which will be a great addition to the marble. Vinegar black is prepared by steeping iron in vinegar for 24 hours; then give them a quick boil on the fire, and when settled, strain and bottle it for use. Vitriol water is made by diluting 1 oz. of sulphuric acid with three ounces of water which must be boiled for use.

Red spots.—Aquaregia, to prepare. Mix in a quart 2 oz. double aquafortis, 1 table spoonful of spirits of salts; ½ oz. of grain tin and 4 oz. of rain water. The whole must remain 24 hours before being used.

Black the cover of the book with the copperas water and when dry, give it a coat of Brazil red, which is a decoction of Brazil wood. Then mix a little of the above aquaregia and dry Brazil wood powder

together and when settled, spot the cover with the red liquid. When the spots are perfectly dry, wash the cover with a sponge and water.

Yellow spots.—Black the cover of the book and when dry, mix aquaregia and turmeric powder together, and when settled, spot the cover with this, then wash.

Leaves, skeliton of, method of obtaining.

The leaves are to be placed in a small portion of water, until they are perfectly putrified and for this purpose the hot weather is to be preferred; they are then to be beaten out and laid upon a marble slab and a dilute stream of clean water is then gently to be poured upon them and thus the putrid particles are washed away, leaving nothing behind but a series of woody fibres which constitute a beautiful net work.

Light Red.

8 parts of nitrate of strontia, 1 part sulphur, $\frac{1}{16}$ of charcoal, with this a small quantity of sulphuret of antimony and chlorate of potash are mixed to render the composition more inflammable.

Another.

Nitrate of strontia 8 drs., sulphur 1 dr., charcoal 30 grs., sulphuret of antimony 10 grs, chlorate of potash 10 grs.

Light Green.

Nitrate of Baryta 8 drs., sulphur 1 dr., charcoal 30 grs., sulphuret of antimony 10 grs., chlorate of potash 10 grs. The above reduced to powder separately and well mixed, will on being ignited yield the former a brilliant red light and the latter a green one.

Linseed oil, method of whitening.

Take any quantity of linseed oil and to every gallon add 2 oz. of litharge, shake it up every day for 14 days then let it settle for a day or two; pour off the clear part into shallow pans, first putting half a pint of spirits of turpentine to each gallon. Place it in the sun and in 3 days it will be as white as nut-oil.

Do. Do., preparation of, for varnishes.

Put 25 gals. linseed-oil into an iron or copper pot that will hold at least 30 gals. Put a fire under and gradually increase the heat, so that the oil may only simmer for 2 hours; during that time the greater part of its moisture escapes; if any scum arises on the surface, skim it off and put it aside for inferior purposes, then increase the heat gradually, and sprinkle it, by a little at a time, 3 lbs of scale litharge, 3lbs of good red lead and 2 lbs of Turkey umbur all well dried from moisture. If any moist driers are added, they will cause the oil to tumify and at the same time darken it and cause it to rise in blisters. As soon as all the driers are added to the oil, keep quietly stirring the driers from the bottom of the pot, otherwise they will burn and blacken the oil. Let the fire be so regulated that the oil shall only boil slowly for 3 hours from the time all the driers were put in; if it then cease to throw up any scum and emit little or no smoke it is necessary to test the temperature by a few quill tops or feathers. Dip a quill top in the oil every two minutes for when the oil is boiled enough, the quill top will crackle or curl up quite burnt; if so, draw out the fire immediately and let the oil remain in the pot at least from 10 to 24 hours or longer if convenient, for the driers settle much sooner when the oil is allowed to cool in the pot than when it is immediately taken out.

Liquid produced from two Solids.

Mix equal portions of sulphate of soda and acetate of lead, both in fine powder; let them be well rubbed together in a stone mortar and a fluid will be produced.

Liquor Red.

4 lb of alum and 3 lbs of acetate of lead are usually taken for standard red liquor which will take 6 quarts of water to reduce it to the working strength.

Lustre Gold for stone ware.

Prepare an aqua-regia composed of 1 oz, nitric acid and 3 oz. of muriatic acid. Throw in a little pure gold in thin sheets and let the action of the acids continue for sometime and then apply heat. 48 grains of gold must be used in 288 grains of the acid compound; when dissolved, add to that solution 4½ grains of granulated tin bit by bit, and then pour some of that compound solution into 20 grains of balsam of sulphur diluted with 10 grains of oil of turpentine. The balsam of sulphur is prepared by heating a pint of linseed-oil and 2 oz. of flowers of sulphur, stirring them continually till the mixture begins to boil, it is then cooled by setting the vessel in cold water, after which it is stirred afresh and strained through linen. The above ingredients after being well mixed are to be allowed to settle for a few minutes; then the remainder, of the solution of the gold is to be poured in and the whole is to be triturated till the mass has assumed such a consistence that the pestle will stand upright in it; lastly there must be added to the mixture 30 grains of oil of turpentine which being ground the gold lustre is ready to be applied. If the lustre is too light pale, more gold must be added and if it have not a sufficiently violet or purple tint, more tin must be added.

Lustre platina.

Of this there are two kinds; one similar to polished steel, another of a silver white hue. To give stone ware the steel colour with the Platina, this metal must be dissolved in an aqua-regia composed of 2 parts of muriatic acid and 1 part of nitric acid. The solution being cooled and poured into a capsule then must be added to it, drop by drop, with continual stirring with a glass rod a spirit of tar composed of equal parts of tar and sulphur boiled in linseed oil

and filtered. If the platina solution be two strong, more spirit of tar must be added to it and if too weak, must it be concentrated by boiling. Then the mixture can be applied to the ware.

Do., Silver to stone ware.

Dissolve to saturation the metal (platina) in an aqua-regia composed of equal parts of nitric and muratic acids, and pour the solution into a quantity of boiling water. At the same time a capsule containing a solution of salammoniac is placed upon a sand bath, and the platina solution being poured into it, the metal will be precipitated, which will be washed with cold water till it is perfectly edalcorated—then dried for use.

This lustre is applied with a camel's hair brush. It is then to be passed through the muffle kiln; but it requires a second application of the platinum to have a sufficient body of lustre.

Do. Platina and gold by other Recipes.

Platina Lustre.—Dissolve 1 ℔ of platinum in aqua-regia formed of 2 parts of muriatic acid and 1 part of nitric acid with heat upon a sand bath, till the liquid is reduced to $\frac{2}{3}$ of its volume let it cool, decant it into a clean vessel and pour into it, drop by drop, with constant stirring some distilled tar, until such a mixture is formed as will give a good result in a time upon the ware in the kiln. If the lustre be too intense more tar must be added; if too weak, it must be concentrated further by evaporation.

Gold Lustre.—Dissolve a little gold in aqua-regia with a gentle heat. To the solution, when cool, add 2 grains of granulated tin which will immediately be dissolved.

Prepare a mixture of half an ounce of balsam of sulphur with a little essence of turpentine heating them together till they assume the appearance of milk. Pour this mixture into the solution of gold

and tin, drop by drop, with incessant stirring and place the whole in a warm place for some time. It is absolutely necessary to apply this lustre only upon an enamel or glaze which has already passed through the fire, otherwise the sulphur will tarnish the composition.

Lustre Iron.

This is attained by dissolving a bit of steel or iron in muriatic acid, mixing the solution with the spirit of tar and applying it to the surface of the ware.

Note.—When marbling is to be given to stone ware, the lustres of gold, platina and iron are used at once, which blending in the fusion form veins like those of marble.

Lute for stone and earthen retorts.

A thin paste must be prepared with common linseed oil and slaked lime, well mixed together and made perfectly plastic that it may be evenly spread. A coating, is commonly put on with a painter's brush and gets sufficiently dry for use in two or three days.

Note.—If at any time during operations the retorts should crack, spread some of the oil composition thick on the cracked parts and sprinkle some powdered slaked lime on it, and it immediately stops the fissure throughly. This may be applied without any danger even when the retort is red hot.

Lute for glass retorts.

The above composition made a little stiffer answers equally well for glass retorts, &c.

Note.—Before applying the above lute to stone or earthen ware retorts, it is always necessary to use a previous coating of the following composition. 2 oz. of borax dissolved in a pint of boiling water with

so much quick lime added as will make it into a thick paste, this must be likewise applied with a brush.

Lute for the joints of steel.

The joints may be made sufficiently air tight by putting between their shoulders coarse cloths, coated on both sides with a thick mixture of wheaten flour and the albumen of eggs. This lute is hardened in coming in contact with hot vapours. The exterior of these joints may be covered with a thick mixture of white lead, ground in oil.

Looking glasses, to plate.

On tin foil fitly disposed on a flat table, mercury is to be poured, and gently rubbed with a hare's foot: it soon unites itself with the tin, which then becomes very resplendent or as the workmen say, is quickened. A plate of glass is then cautiously to be slid upon the tin leaf in such a manner as to sweep off the redundant mercury which is not incorporated with the tin; leaden weights are then to be placed on the glass and in a little time the amalgam adheres so firmly that the weights may be removed without any danger of its falling off. About 2 oz. of mercury are sufficient for covering 3 square feet of glass.

Madder, the root of Rubia tinctorium.

Contains three different colours—madder purple,—red and orange. All these are volatile and the sublimed crystals of madder-red are called Alizarine. This is the substance which yields the Turkey-red dye. With alkalies it yields purple or violet colour, with acids yellow.

When dissolved in hot water or alcohol; Alizarine yields rose-coloured solutions.

Do., purple and red.

Boil the clean root repeatedly in a concentrated solution of alum and filter whilst hot. On cooling a brownish red subsidence—consisting principally of madder red—occurs and must be removed by decantation. Next add sulphuric acid to the menstru-um which gradually throws down the purple. It may be purified by boiling in hydrochloric acid, digesting in alcohol, finally distilling off the spirit and allowing the spirit and the residue to evaporate spontaneously.

Madder red is extracted from the aluminous deposit just mentioned, by boiling in dilute hydrochloric acid, and dissolving in alcohol. This is then boiled with strong solution of alum which causes the precipitation of the madder-red. It is purified by dissolving in ether, and the menstruum, on evaporating spontaneously, leaves it as a yellowish brown crystalline powder.

Marble, a rude imitation of.

Dissolve in several earthen ware pots, small quantities of sulphur and when melted, add in one pot or a little vermilion for a red, verdigris finely powdered add to another pot for a green, and lamp black to a third for a black; the sulphur of itself giving a beautiful yellow.

Remark that the tint selected for a ground must exceed in quantity all the others together.

Previously get ready a piece of slate either of a circular or square form with a narrow run projecting about $\frac{1}{8}$ of an inch in thickness. Oil carefully the slate and with a piece of either cane or bamboo the point of which has been crushed by beating it with a hammer, prepare to take out each of the different kinds of melted sulphur, taking care to have as many of the bamboo brushes as there are colours prepared, then dip the brush in the melted sulphur and sprinkle it all over the slate slab, in dots, veins any grotesque forms that may be fancied; the more diversified the colours are the better will be the

appearance of the artificial marble; when enough of these dots-veins, &c., have been made the pot containing the melted sulphur for the ground must now be carefully turned over the slate and the contents allowed evenly to imbibe the whole, when it has reached the level of the run, pouring must be ceased and the whole allowed to cool. On turning the mould over you will see a slate, the ground of which is of one uniform colour with various coloured dots and veins on its surface having a close resemblance to marble; slates of this kind are made for ornamenting the tops of boxes and other similar articles.

N. B.—For the ground, black is generally preferred as it shows off by contrast the beauties of the other tints.

Marbling paper, on the French method of.

The utensils employed by the marbler are not very numerous. Firstly, a vat, formed of teak planks, well fitted together so as to be perfectly water-tight—secondly, a small cylindrical staff—thirdly, several earthen vessels to contain the colours and other preparations—fourthly, a small portable stove or furnace and fifthly a grinding stone of porphyry marble or any other polished stone and a muller to grind the colours, are however indispensible requisites.

1. On the preparation of the gum. Put into a proper vessel half a pailful of water and dissolve in the cold 3 oz. of gum traga canth, stirring it frequently for 6 days (a shorter period will do for India for it is hotter than France). This is termed the couch or bed and upon this bed are to be spread the colours which serve to form the marbling; they do not however, mingle with each other, the marbler must, likewise, provide a solution of gum much stronger than the above, in order to increase the thickness of the bed, when necessary, of which he will make a proof in the manner to be hereafter described.

2. Preparation of the Ox-gall. Put the gall into a dish and add

to it an equal quantity of water and beat the whole well together; then add to it 18 grammes of camphor, which has been previously dissolved in 25 grammes of alcohol and again beat up the whole thoroughly, and pass it through a filtering paper.

N. B.—This preparation should not be made earlier than the day before it is to be used, lest it should be spoiled by keeping.

3. Preparation of the wax. Over a slow fire in a glazed earthen vessel melt yellow virgin wax; when it is melted it is withdrawn from over the fire; then mix with it, by degress and stirring it continually a sufficient quantity of essence of turpentine to give it the consistence of honey. Assertain when it has attained a proper degree of fluidity by putting a drop of the mixture upon the nail from time to time and letting it cool, and add more of the turpentine if it is too thick. Like the Ox-gall, the wax, must not be prepared too long before using it.

4. Of the colours to be employed. Do not make use of the heavy mineral colours in marbling; animal and vegetable colours and the ochres are the only ones which can be employed with success. The other mineral colours are too heavy and could not be supported upon the surface of the ground water.

For yellow, employ Naple's yellow or the yellow lake from weld. The golden yellow with terra-de-sienna in its unburnt state.

For blue of different shades of strengh use the best indigo known by the name of flower of indigo.

For Red either employ carmine or carmine lake.

For Brown—umber.

For Black, Ivory black. The white is produced by the Ox gall itself.

Green is produced by the mixture of blue and yellow.

Violet, by yellow and red.

N B. The (terra-de-sienna) flower of indigo, and the carmin-lake, are employed separately in the manner to be described here-

after forming very fine sharp figures, which may be varied ad-infinitum.

5. On the preparation of colours.

These are to be ground very fine, and made into mixtures of the consistence of a thick soap; upon the slab of marble or porphyry with the prepared water together a few drops of alcohol. When they are well ground together, take up a small quantity of the colour with a table knife, incline and let the colour fall upon the surface of the gummed water to prove its consistency when each colour is ground and mixed up, it must be put into a pot and kept apart from the other.

6. On the preparation of the marbling bath. From the vessel which contains the prepared gum, take a sufficient quantity of it to cover the bottom of the marbling vat, to the depth of an inch at least. Add then 20 grammes of alum in fine powder, and beat it well up, to dissolve the alum.

Then put a spoonful or two of this prepared water into a Champaign glass, in order to make the necessary trial with it, to ascertain whether the gummed water be of the proper consistence for use as follows.

Take a little of the colour which has been ground of a sufficient consistence with the prepared ox-gall and throw a drop of it upon the gummed water in the conical glass and stir it in a circular manner with the small rod. If it extend well, and form a spiral figure without dissolving in the gum, it is sufficiently strong; if on the contrary, the colour will not turn, the gummed water is too thick and water must be added to it, and be well mixed with it by beating it up; but if the colour spread too much and dissolve in the gum water, then some of the thicker prepared gummed water must be added to it, which was kept in reserve for this purpose. At every time of adding either water or gum, the whole must be well beaten up to make the mixture perfect. After every trial the conical vessel must be emptied and its contents thrown aside and a fresh portion of the gummed water employed.

When the gummed water has thus been brought to the desired consistence it must be passed through a sieve into the marbling vat to the height of an inch as it had been before directed.

7. The marbling vat being thus prepared, and all the colours ground and thickened with the prepared wax and ox-gall, so that they may neither be of too thick nor thin a consistence, take first the gall, and spread more or less of it upon the gummed water. The colour which is first thrown on is less thick than the succeeding one, and that again thicker than the one preceding and so on.

First throw on the red, for instance. All the other colours, intended to be used, are then thrown, one after another; that which is laid on the second presses the first on all sides, and as the number of the colours is the more considerable so the first is spread and occupies a larger space. When the colours, which are employed, are thrown, if you desire that the marbling should take the form of volutes or spirals, hold a rod upright and then carry it along amidst the colours in a spiral manner, that is dipping it here and there and giving the colour a twist or spin with it. The colours are then thrown on with a kind of brush which may be thus prepared. Take for the handles of these brushes cylindrical pieces of wood, each about half a foot in length and two lines in the thickness, tie to the end of each about 150 horse hairs with strong pack thread, the hair should be at least an inch long. These long bristles more resemble brooms than brushes. With the assistance of these, thrown on here and there all over the gummed water the first colour, then in the middle of that the second, then the third and so on; so that when they are spread, these sets of colour approach one another and then they are stirred in a spiral or any other shape as is desired. For example. Suppose we wish to give the marbling the form known by that of the "partridge's eye," prepare two tints of blue with the flower of indigo, the one such as it has been before mentioned and which is designated by the name of indigo N o1. The other in a different vessel and to which add a large proportion of the prepared gall and term indigo No. 2; after the first, throw on the carminic lake, secondly, the terra-de-sienna; thirdly, the indigo No. 1 and fourthly, the indigo No. 2 after which throw on with a jerk, two

drops of essence of turpentine. The blue No. 2, last laid on, extends all the other colours, and affords a clear blue in spots which produces a fine effect. It is the essence of turpentine that this effect is owing; therefore add a little of it to all the colours which are to be thrown on last; it would be useless to mix it with the preceding ones.

When all is thus disposed, the marbler takes his paper and commences his manipulation. Instead of using a round staff, a comb with teeth, more or less apart, should be used to form the volutes; indeed this is an improvement on the method first recommended.

All the address consists in adroitly placing the sheet of paper perfectly flat upon the surface of gummed water which supports the colours and to withdraw it again without deranging them. In order to do this, the workman takes between the thumb and forefinger of one hand the sheet, in the middle of one of its ends; and with the other hand and between the thumb and fore finger also the middle of the other end of the sheet. He then lays the sheet upon the gummed water and again removes it without suffering it to slide upon the coloured surface. He then hangs the sheet upon the bar of a frame with the coloured side outwards, to evaporate the water and to dry it.

This sheet being thus finished, he marbles a second; but he adds always fresh colours after every one is dipped. When the sheets are dry, they are waxed, glazed and folded for sale.

Marbles, to colour.

This is a nice art and in order to succeed in it, the pieces of marble on which the experiments are tried, must be well polished. The harder the marble is the better it will bear the heat necessary in the operations; therefore alabaster and the soft white marble, so commonly met with, are very improper for performing the operation upon.

Application of heat. Heat is always necessary for opening the pores of the marble, so as to render it fit to receive the colours; but the marble must not be made red hot; for then its texture is sure to be injured, and the colours are burnt and so lose their beauty. Too small a degree of heat again is as bad as too great; for in this case

though the marble receives the colours they will not be fixed in it nor sink deep enough. The proper degree is that, which without making the marbles red hot will yet make the liquor boil upon its surface.

Colours for do.

Stone blue dissolved in six times the quantity of spirit of wine. An extract of saffron and sap green succeed well when dissolved in wine and quicklime. For vermilion—the same as above. Dragon's blood succeeds in alcohol as likewise a tincture of logwood. Besides these mixtures there are other colours, which must be laid on dry and unmixed. Dragon's blood of the finest kind for a red, gamboge for a yellow, the marble for these operations must be made considerably hot and then the colours are to be rubbed on dry. For a fine gold colour. Take crude salammoniac, white vitriol and verdigris of each an equal quantity. Mix the whole thoroughly in fine powder. The staining of marble to all degrees of red or yellow by solutions of Dragon's blood or gamboge may be done by reducing these gums to powder and grinding them with spirit of wine in a glass mortar. But for small attempts, no method is so good as the mixing a little further of these powders with alcohol in a silver spoon, and holding it over burning charcoal. By this means a fine tincture will be extracted and with a pencil dipped in this, the finest traces may be made on the marble while cold : which on the heating of it afterwards either on sand or a baker's oven will all sink very deep and remain perfectly distinct on the slab. It is very easy to make the ground colour of the marble red or yellow by this mode, and leave white veins in it. This is to be done by covering the pieces, when the whiteness is to remain, with some white paint, or even with a thick coating of paper pasted on, either of which will prevent the colour from penetrating.

Meat, preserving.

To preserve meat fresh for a few days in warm weather, wash it lightly over with a brush or sponge with a mixture composed

of $\frac{2}{3}$ of pyrogleneous acid and $\frac{1}{3}$ water; the acid which is a kind of vinegar, gives it no flavor that is unpleasant and the meat requires no washing before being cooked.

Metal for flute key valves and flutes.

Fuse in a crucible 4 oz. of lead and 2 oz. of regulus of antimony, and cast into a bar. The appearance of this compound is just like silver.

Metal Britannia.

3½oz. of best block tin, 28 lb of regulus of antimony, 8lb of copper and 8lb of brass. First melt the tin then pour into it the regulus of antimony and afterwards the copper and brass from the crucible in which they have been melted. The whole well stirred with an iron rod is converted to the compound known as Britannia metal.

Mineral-yellow, fine to fix upon wool, silk, cotton, &c.

Mix 1 lb of sulphur, 2lb of white oxide of arsenic, 5 parts of pearlash; and melt the whole into a crucible at a heat a little short redness. The result is a yellow mass, which is to be filtered to remove all impurities. Dilute the filtered liquor, then add weak sulphuric acid which produces a flocculent precipitate of a most brilliant yellow-colour. This precipitate washed upon a cloth filter dissolves with the utmost ease in liquid ammonia giving a yellow solution, which colour is to be removed by an excess of alkali.

Milk of wax.

Melt in a porcelain capsule a certain quantity of white wax, and add to it, while in a state of fusion, an equal quantity of spirits

of wine and pour it upon a porphyry slab. The granular mass is to be converted into a paste by the muller with the addition, from time to time, of a little alcohol and as soon as it appears to be smooth and homogeneous, water is to be introduced in small quantities successively to the amount of 4 times the weight of wax. Then it must be passed through canvas or course cloth to set it free from impurities. This may be spread with a brush upon the surface of a painting, allowed to dry and then fused by passing a hot salamander over its surface. When cold, it is to be rubbed with a linen cloth to bring out the lustre.

Moiree Metalique.

Is a variegated primrose appearance produced upon the surface of tin plate by applying to it in a heated state some nitro-muriatic acid in a dilute state for a few seconds then washing it with water, drying and coating it with lacquer varnish or any transparent colour.

Montpellier yellow, to make.

Take 4 oz. of litharge, well sifted ; divide it into 4 equal parts and put it into as many glazed earthen vessels. Dissolve also 1lb of sea-salt in 4 of pints of water. Pour $\frac{1}{4}$ of this solution into each of the 4 earthen vessels to form a light paste. Let the whole rest for some hours and the surface begins to grow white, stir the mass, with a strong wooden spatula. As the consistence increases, dilute the matter with a new quantity of the solution, and if this is not sufficient, recourse must be had to simple water, to maintain the same consistence. The paste will then be very white and in the course of 24 hours becomes uniform and free from lumps : let it remain for the same space of time ; but stir it at intervals to complete the decomposition of the salt. The paste is then well washed to remove the caustic soda, which adheres to it, the mass is then put into strong linen cloth and subjected to a press. The remaining paste is distri-

buted in flat vessels, which are exposed to heat in order to affect proper oxidation (calcination) which converts it into a solid, yellow, brilliant matter which is Montpellier's yellow.

Mordants.

No. 1. In 22 gallons of water dissolve 88lbs of alum, 8·8lbs crystals of soda (carbonate of soda) 88·0 lbs acetate of lead.

No. 2. In 22 gallons of water dissolve 60lbs of alum 6·0 lbs. of soda crystals, 440lbs of acetate of lead.

No. 3. In 22 gallons of water dissolve 44·5lbs alum, 5·0lbs of crystals of soda, 29·7lb of acetate of lead.

Mordant in dying, experiment demonstrating the use and advantage of.

If white cloth without any preparation be boiled in a decoction of madder, a dirty red tinge neither agreeable nor permanent will be given to it. But if the cloth be previously passed through a weak solution of acetate of alumina, then dried at a temperature and afterwards washed, a portion of the alumina is retained in chemical combination with the texture of the cloth and when thus prepared and submitted to the action of a hot decoction of madder and again washed, it comes out of a fine red, which is fixed in consequence of the affinity of the alum for the colouring matter. If the mordant used, be oxide of iron, the colour which is then produced is purple. Yellow is obtained by having cloth impregnated with acetate of lead through a solution of chromate of potash, and blue is produced by passing cloth previously mordanted with iron through an acidulated solution of ferrocynate of potash; scarlet is fixed by an oxide of tin or by alumina and heightened by the action of tartar.

Mordant Red.

To one hundred and ten parts of a solution of sulphate alumina marking 52° Twaddle when it is hot, and 56° when cold, add one hundred parts of acetate of lead in 30 parts of water, a double decomposition takes place between these two salts and a solution of acetate of lead is obtained marking 24° to 26°. The most concentrated that can be obtained.

Meerschaum, artificial, &c.

Chemistry has discovered, writes the Intellectual Observer, a new and interesting use for potatoes and other vegetables, illustrations of which might be seen by visitors at the Paris International Exhibition.

If potatoes are peeled, macerated about 36 hours in water, to which 8 percent of sulphuric acid has been added, well washed with water dried in blotting paper and then in hot sand for several days, on plates of chalk or Plaster of Paris, which are changed daily being compressed at the same time, an excellent imitation of meerschaum, answering well for the carver or any purpose not requiring a high temperature will be obtained. Great hardness, whiteness and elasticity will be produced if water containing 3 per cent of soda instead of 8 per cent sulphuric acid is used and if after the potatoes have been macerated in the solution of soda, they are to be boiled in a solution containing 19 per cent soda, a substance resembling stag's horn, and which may be used for knife handles &c., will be formed. Turnips may be used instead of potatoes in production of the artificial horn; and if carrots are substituted for the potatoes, a very excellent artificial coral will be obtained.—*Englishman 28th January* 1867.

Morocco Leather, preparing on.

The skins employed for this purpose are those of goats and sheep. All skins are not fit to receive the dilute dyes, especially the reds.

It is nevertheless impossible with all one's care to perceive in the selection the slight cuts made in the skins by the knife of the flayer or the small holes and other injuries left on them from punctures of the insects; but which are, however sufficient to render the skins greatly defective when they are to be dyed red, which is a colour the most delicate and requires the highest perfection in the skins and thus the operator is perfectly obliged, in the progress of the manufacture to submit his skins to new inspections and class them then for dying, that is to say, to reserve the defective ones for the darker tints and employ the finer ones for the brighter colours and especially for the reds. The goat skins are generally received in hacks in a dry state and therefore the first process they are subjected to is intended to soften them, and to open their pores, in order to make the substances employed in the succeeding operations to penetrate them. This object is readily obtained by immersing them in stagnant water for a longer or shorter time according to their degree of dryness, their thickness and the temperature of the season. In this first steeping they undergo a kind of fermentation, which must not be carried too far, without danger of putrifying the skins. When the skins are sufficiently softened, they separate any morsels of fat or flesh which the butchers may have left upon them. After this preparation they are again steeped in fresh and cold water. When the skins have been well drained, they are put into square pits, filled with lime, mixed more or less with water; these pits may be constructed either of stone or wood and are about five feet long and as many feet deep. The intent of this new immersion is to loosen the roots of the hair and permit it to be removed easily, care must be taken not to leave the skins boiling in the solution of lime, as then they run the risk of being too much corroded. In order to proceed with more certainty the steeping of the skins in lime water is usually commenced in these pits, where from length of time, the lime has become partly carbonated by the action of the atmosphere and thus become less energetic and likely to injure animal texture. It is also necessary that the progress be neither too quick nor too slow. If the pit be too strong, it will be seen that the skins are

powerfully attacked by the lime after a day's immersion, or even that of two, it will be seen that the skins are powerfully attacked by the lime and it becomes necessary to remove them into a weaker one. If on the contrary, we find at the end of 12 or 15 days, that the hair is not loosened, then we must have recourse to a pit capable of acting upon them with more power. We must also take care during each immersion not only to lift the skins from time to time, in order to permit the lime to renew itself, and to penetrate to both sides of the skins but we must also take them out of the pit and replace them again, at least once in every two days' time. When they have been steeped for the proper time they are taken out of the pits to be scraped in the following manner. Each skin is properly stretched over the horse and with the aid of a blunt round knife, similar to that used by the tanners, the hair is removed; in order to do this, it is sufficient to pass the knife backwards and forwards over the entire surface of the skin at the same time exerting a slight degree of pressure. This operation being finished, proceed to the succeeding one, which consists in completely freeing the skin from the particles of lime contained in the skin. This is essentially necessary to the final success of the process, which the time would scarcely frustrate by giving to the dyes a great number of shades, which from their multiplicity would be exceedingly expensive to remove. This is easily done by laying the skins to cleanse themselves in a river for one or two days. At this time also they shave and equalize the thickness of the skins. The skins are then rubbed carefully down with a flat stone; by the slight pressure they exert in using it, the last remains of the lime, which still adhere to the skin are expelled and at the same time that side of the skin having the hair on is softened by this operation. Then after having well drained the skins they repeat the process of rubbing upon the flesh side of them; they are then ready to undergo the preserving process. The skins are now beaten about for a quarter of an hour, each time in a barrel mounted horizontally upon two necks or pivots and the inside of which barrel is furnished with a great number of wooden pins rounded at their sides. They introduce the skins into the vessel

a quantity of water proportioned to their number, and after closing it they turn it rapidly round by means of a handle or winch fixed upon the axis of a toothed wheel, which acts in a pinion affixed upon the axis of the barrel. Many operators use a less quantity of lime in their steeping vats but add merely wood-ashes instead. The skins are then subjected to a third bath prepared by steeping common bran in water slightly fermented so as to render the water slightly sour. When the skins undergo these different processes and have been well washed they must be hung upon the horse to dry and then those, which are intended to be dyed red are immediately salted, in order to preserve them until they are to be dyed. We may observe on this last point, that the salt most probably performs another office and that it not only preserves the skins, but it is in fact, that whenever the salt comes into contact with soft animal substances it first swells them up; but it afterwards causes a great part of the water, which they had absorbed, to flow out and then makes them shrink. Another advantage likewise results, which is, that the skin becomes less porous and more difficultly penetrated by the dye, and which consequently can be used with more profit, from similar motive each skin is folded double and stitched along its edges in order that the dye may not be applied to the flesh side.

To dye Morocco leather red.

The skins intended to be dyed red, being supposed to be properly prepared and entirely freed from the lime, are each doubled singly with flesh side in wards and stitched along their edges as mentioned above and then dipped with a solution of tin or a mordant of alum; the proportion being 12lb of Roman alum for every 8 dozen of skins. This salt is to be dissolved in about 30 French pints of hot water and when the hot solution has become luke warm, the skins are to be successively plunged into it and be suffered to remain for a few moments; when they are to be drained, wrung and hung upon a horse, to remove all the folds from them. The skins being thus

mordanted by either of the above methods and sometimes also by both of them are ready to be dyed.

In order to prepare the dying bath they take about 10 or 12 oz. of bruized cochineal and dilute it with a sufficient quantity of water, to which they also add a little alum or cream of tartar; they then boil the whole for a few minutes in a copper vessel, and then pass the decoction through a fine linen cloth; they then divide this bath into two several portions, in order to give the skins two successive dips. They put the first half into a turning vessel of a construction similar to that we have described for washing the skin in and then turn it from 100 to 150 rotations, or about for half an hour when they renovate the bath by the addition of the decoction and then proceed to give the skins a second agitation for the same time. When they are dyed they are raised and turned. It may be here remarked that the residium of this dying bath although it be not capable of communicating more than a very weak tint to the skins is nevertheless not exhausted of its colouring matter, but still contains abundance thereof yet in such a state of combination, that the mordant fixed in the skins is not able to take it up readily and this proportion of colour has also less brilliancy. In order to extract the remainder of the colouring matter, they add to the residium of the bath an excess of the muriate of tin or alum which causes it to precipitate; and this powder they sell to the manufacturers of paper hangings or other persons requiring a little inferior crimson.

The turning of Morocco leather is ordinarily performed with sumach in those countries where gall-nuts are expensive. They usually employ 2 ℔ of sumach for each ordinary sized skin and $2\frac{1}{2}$ lbs. or 3 lbs. for those of larger sizes. This operation is performed in a large bath, made of white wood of a conical form, and which will hold from 8 to 10 dozens of skin; it is from 15 to 18 feet wide, in its greatest diameter and 5 in depth, we may readily conceive that these large dimensions are necessary, when we know that the skins are extended like balloons, and that it is not easy to manage

them in the tanning. They fill this vat ⅔ high with water and sumach, they then take the skins, which had been previously sewed together about their edges and make an opening at an end, in order to fill them with some sumach and water from the vat; they then tie these openings close with pack-thread and when they are all thus prepared, they are each turned or swung in the vat by the power of two men in succession for quarter of an hour. At the end of this time they are removed and placed upon a kind of bridge, which is fixed over the vat, in such a manner that the water which drops from them shall fall again into the vat. They are thus filled and emptied twice in the space of 24 hours. When the operation has been well conducted and the sumach is of a good quality, this time is sufficient for the tanning to be completed in; and when this is done the skins are unstitched, rinsed, and beaten once or twice with rammer, they are then drained upon a table by rubbing them all over with a blunt blade of copper, with a round edge and then turning up to dry.

When the operators to enliven the red colour, when the skins are about half dry, pass a fine sponge over them, which is moistened by a solution of carmine made in ammonia. Others wet them with a decoction of saffron which gives them a scarlet tinge. When the skins are intended to receive other colours, they are tanned rather differently. For instance, they put 10 dozens of skins into a vat of about 7 or 8 feet in diameter also of white wood with a proportionate quantity of water and sumach; these are turned about all day by four workmen furnished with wooden shovels; in the evening they are taken out and placed upon the planks supported over the vat; and when the sumach and water have drained from them, they are laid all night in clear water, this work is renewed during 2 or 3 days, and this time is sufficient to tan them in, other manufacturers prefer to tan their skins with gall nuts and they proportion the quantity of them according to the time employed in the tanning process; white galls are chosen for this purpose as less likely to injure the tint. They employ about 1lb for each skin. In this tanning process, they commence by mixing with cold water half of the quantity of pulverized and sifted galls necessary to be used. They then agi-

tate the mixture a little and also renew the stirring when the skins are put in, in about an hour afterwards they add the remainder of the galls and suffer the whole to remain at rest for about 2 hours. They then incessantly stir the skins about 5 hours with wooden shovels and let them remain all night; but they take them out next morning after they have allowed to drain them a few moments, they are again put into the bath and it is strongly agitated a new to mix the component parts of it thoroughly; after remaining in the bath from 15 to 20 hours, the operation is finished. When the skins are tanned they are cleansed with great care, in order not to hinder the application of the colours with which they are to be dyed; thus they are rinsed thoroughly and then well beaten with rammers in a vat with water, and finally they give them a dressing on the flesh side upon the horse with a blunt edged knife. After this dressing they are put into luke warm water and they then give them a dressing on the hair side likewise with a blunt knife in order to clear the surface and to soften it. When the skins are become less hard, they are again subjected to a third dressing, similar to the second. At the time of dying the skins, they are again steeped in little warm water and are then doubled and stitched together with the hair side outwards. They generally produce the colours by twice dipping.

Most manufacturers dye their skins, with the exception of the reds, in small, long and narrow wooden troughs, and they dip their skins at a temperature as high as the workmen can bear, and which heat they continue until they have obtained the required tint. When they have procured the degree of intensity, which they wish, they remove the skins from the dye and rinse them; they then rub over them a little oil to prevent them from being hardened in the air, and immediately hang them up, extended them in an airy room, where, however the rays of the sun cannot reach them as otherwise the colours will be turpid. As no colours but the reds present any difficulty, and the skins readily take any dyes so we shall only summarily indicate the dying materials employed to obtain any desired colour.

Do. Black.

Black is produced by impregnating the hair side of the skins with a solution of iron applied by means of a brush; this solution of iron is obtained by digesting old rusty scrips in sour beer.

Do. Blue.

Blue, colour is dyed in a vat with indigo dissolved in sulphuric acid. Some prefer a vat prepared with indigo, green copperas (sulphate of iron) and lime. This dye is made in the cold and the skins are subjected to more or less dips according to the tint which they would produce.

Do. Violet.

This dye is given by one or two dippings of blue, which they afterwards glaze by passing the skins through a bath more or less charged with cochenial agreeably to the shade required.

Do. Green.

First pass the skins through a blue vat, and afterwards through one of yellow, by steeping the skins dyed blue in a decoction of Barberry roots cut small, to which they also add a little alum to serve as a mordant.

Do Olive.

To dye this colour, the skins are first passed through a dilute solution of green copperas and then through a yellow decoction, to which may be added more or less of the solution of indigo, according to the shade.

Do. General note for.

When the skins are dyed, the hair sides of them should have a slight coat of linseed oil applied all over them with a sponge,

in order to cause the polisher to slide over them, when they are subjected to the currying over in order also to prevent them from becoming hard by drying. The last operation to which the skins are subjected, is the currying ; this serves to bring out their lustre and to render them supple, this operation is performed in various ways according to the uses to which the skins are to be applied. For covering port folios, pocket books, knife and spectacle cases, they are shaved as thin as possible on the flesh sides, they are then again moistened and passed three or four times through a grooved cylindrical press in different directions, to cross the grain.

With the help of the primitive colours already mentioned, and by employing proper mordants, we can compose all the other colours, for they indeed result from the mixture of these in various proportions.

FINIS.

ERRATA.

Page	Line	For	Read
5	11	vineerg	vinegar
7	8	amonia	ammonia
,,	12	do	do
,,	18	salamonia	salammonia
15	1	do	do
,,	14	do	do
,,	21	do	do
16	18	yellow	yellow
18	22	isingglass	isinglass
19	3	do	do
,,	24	Romam	Roman
20	23	monstrum	menstruum
22	23	cauldron	caldron
23	2	isingglass	isinglass
33	15	or	on
33	20	vegitable	vegetable
35	10	stiffning	stiffening
,,	11	do	do
,,	21	and	be
40	6	neutrallization	neutralisation
43	32	coercitren	quercitron
46	18	anotto	annotto
49	6	throughly	thoroughly
53	2	prepared	prepared as
62	3	evoporate	evaporate
62	27	pice	pieces
64	19	saturated	satdrated
65	2	war	waro
66	28	flnt	flint
71	25	runing	running
72	20	litle	little
73	5	occassion	acoasion
74	11 12	neck which	rieck
,,	23	or piment	orpiment
77	5	calcunded	calcined
87	2	rdgid	rigid
,,	10	and and	and
88	16	a quaregia	aqua regia
,,	25	phosporetted	phosphoretted
93	11	parasatic	parasitic
,,	22	drchms	drachms
94	18	accasia	acacia
95	17	cochenial	cochineal
100	20	projets	projects
102	14	matals	metals
,,	15	leathr	leathers
,,	18	course	coarse
103	4	vegitable	vegetable
106	20	must	must
108	3	throughly	thoroughly
,,	4	vegitable	vegetable
,,	6	effervescescence	effervescence
109	11	anotto	annotto
,,	14	ebullion	ebullition
110	21	limited	united
,,	27 28	sulpur	sulphur
112	7	skelton	skeleton
113	15	umbur	umber
116	20	throughly	thoroughly
118	18	or a little	a little
119	20	indispensible	indispensable
120	9	degress	degrees
120	29	carmin	carmine
,,	11	assertain	ascertain
,,	23	strengh	strength
25	1	pyrogeneous	pyroligneous
26	6	course	coarse
,,	20	of pints	pints
31	26	in wards	inward
34	7	a new	anew
35	14	cochinal	cochineal
35	6	Blue	Blue
,,	14	cochenial	cochineal